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SOME ASPECTS OF CONSERVATION IN THE UNITED STATES

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It was during the nineteenth century that the full magnificence of extent and the seemingly boundless wealth of their continent came to the consciousness of the American people. The early settlers, especially those of British stock, had been more impressed with the difficulties which the new land presented, with the lack of amenity, with the endlessness of the forests and the persistence of the stony, unremunerative earth. Even in the South, where conditions were less harsh and where indentured or negro labour performed many of the manual tasks, life did not compare favourably with conditions in the old country. But the discoveries and inventions of the late eighteenth and the nineteenth centuries encouraged an enthusiasm and optimism which the prevailing utilitarianism supported and blessed. European settlement, decreasingly British in its origins, swept westwards, and each new advance created larger hopes of prosperity without end. The wealth of the United States, the fertility of the land, the availability of timber, the supplies of coal, the metal resources, and later the wells of petroleum, seemed to offer an inexhaustible abundance which awaited only man's ingenuity and industry. In the presence of such plenitude it was reckoned foolishness to counsel economy and caution. Extravagance and wastefulness were the vogue. The enterprising did things in a big way. There was no need to think of the morrow. No sense of stewardship developed, no awareness of responsibility to future generations.

But in the last quarter of the nineteenth century, the more perceptive observers of national life began to realise that the United States was not Utopia Unlimited.[1] The scientific societies, notably the American Association for the Advancement of Science and the National Academy of Sciences, sought to make the public aware of the rapid depletion of the country's natural wealth and of the increasing need for measures of conservation.[2] In 1872 a beginning

had been made with the establishment of the upper part of the Yellowstone River valley as a national park. Other areas have since been similarly preserved, and now the National Park Service controls thirty-six national parks and sixty-seven national monuments, a total area of over six million acres.[3] In 1891 the Congress passed the first act granting the President power to withdraw from homestead-entry areas of public land suitable for forest reserves. But it was not until the presidency of Theodore Roosevelt that the need for conservation was clearly placed before the people as a national necessity. He called the Governors of all the States and Territories in the Union to a conference at the White House, where, with the help of scientists and public administrators, he emphasised their obligation to co-operate in the prevention of further wastage of the national heritage. Following the conference, a national conservation committee was appointed to explore and make an inventory of the available natural resources of the United States, to estimate the rate of consumption, and to assess the probability of exhaustion.[4] Under order of the President, in 1909 148 million acres of forest land, 80 million acres of coal land, 1½ million acres of power sites, and nearly 5 million acres of phosphate lands were withdrawn from the public domain. Roosevelt would have gone even further in this policy of reservation, but Congress demurred and refused to enact the necessary legislation.

Although small groups continued to agitate for the adoption of a conservation programme, during the second and third decades of this century little was done. The war of 1914-1918 accelerated the rate of exploitation and the urban prosperity of the 'twenties intoxicated the people with a sense of limitless power of achievement. The American way was best. But *laissez-faire* did not work for the greatest good, and government intervention became essential. President Hoover was aware of the benefits which would accrue to the nation from a well-conceived policy of national development. He inaugurated a number of investigations and set up some agencies which, had the Administration not been overwhelmed and confused by economic depression, might have formed the basis for a broad scheme of national resource planning.

It was the Roosevelt Government of 1933 which, utilising some of the data gathered and the organisations established by its predecessor, initiated a nation-wide, comprehensive effort to conserve the national wealth of the United States. Conservation is an essential part of the New Deal philosophy of the responsibilities of government, and in the course of the past five years the New Dealers have elaborated and extended the implications of the concept. There were many shortcomings in the earlier attempts of the Administration to implement its policy, and schemes were started without the necessary preliminary work and preparation. It was not so much that the Administration was unaware of the dangers of such precipitate action as that the conservation pro-

gramme was tied to the need for unemployment relief, which would allow of no delay. The earlier ventures were frequently expensive and their value dubious, but, in the course of six years, the effort has become more concerted, better planned, and more clearly envisaged in terms of long-period objectives. It has become obvious that the damage of a century cannot be remedied or repaired within a few years, no matter how dramatic the steps taken nor how well publicised the immediate results.

One of the most distinctive contributions of the present Administration to the reconstruction of American agriculture has been the inauguration of the Soil Erosion Service, or as it is now called, the Soil Conservation Service (S.C.S.).[5] Soil erosion is basically a consequence of the depletion of the humus content of the soil and the destruction of its natural texture. Such a deterioration may be brought about in several ways, the resultant forms of erosion varying in accordance with conditions of topography, climate, and the vegetation cover. A primary distinction is to be drawn between water erosion and wind erosion, though both may occur within the same area and may operate jointly to destroy the value of the land for human settlement. Within the United States (east of the Rockies), two major areas of soil erosion can be recognised: between the Atlantic coastal plain and the Mississippi, water erosion is dominant and wind erosion is of slight importance; on the Plains, wind erosion has affected wide areas, reducing and destroying the utility of the land, but in addition, particularly along the marginal bluffs of the river flood plains, water erosion has been responsible for serious damage to the soil. The areas which have suffered little from man-induced erosion form a fringe around the eastern region and include a large part of the Great Lakes plains, most of New England, the seaward margin of the Atlantic and Gulf coastal plains, and the floor of the Mississippi valley. This relative immunity is to be accounted for by the low erodibility of the soils, the absence of marked differences of relief, and by the humidity of a climate which shows no pronounced dry season (Fig. 1).

But, while physical conditions help to explain the presence or absence of erosion, its actual occurrence is the result of the use to which the land has been put; and the full explanation has to take into account the historical evolution of the area and even the antecedents of the settlers. This is most apparent when soil erosion in the Piedmont of the South or in the Great Plains is considered. Everywhere soil erosion is a consequence of the disturbance by human activities of the equilibrium between environmental elements, and of the failure to introduce cultural practices which would bring into being a new balance. Over large parts of North America the disturbance has been followed by sheet-washing of the top-soil and the carving up of the surface by gullies and by wind erosion, and vast areas of formerly productive land have lost their fertility and have, in many parts, become sub-marginal—that is, incapable of

giving a remunerative return for the effort expended upon them (Plates 1 and 2).

Soil erosion, in common with every other aspect of the national problems of agriculture, is present in a severe form in the Old

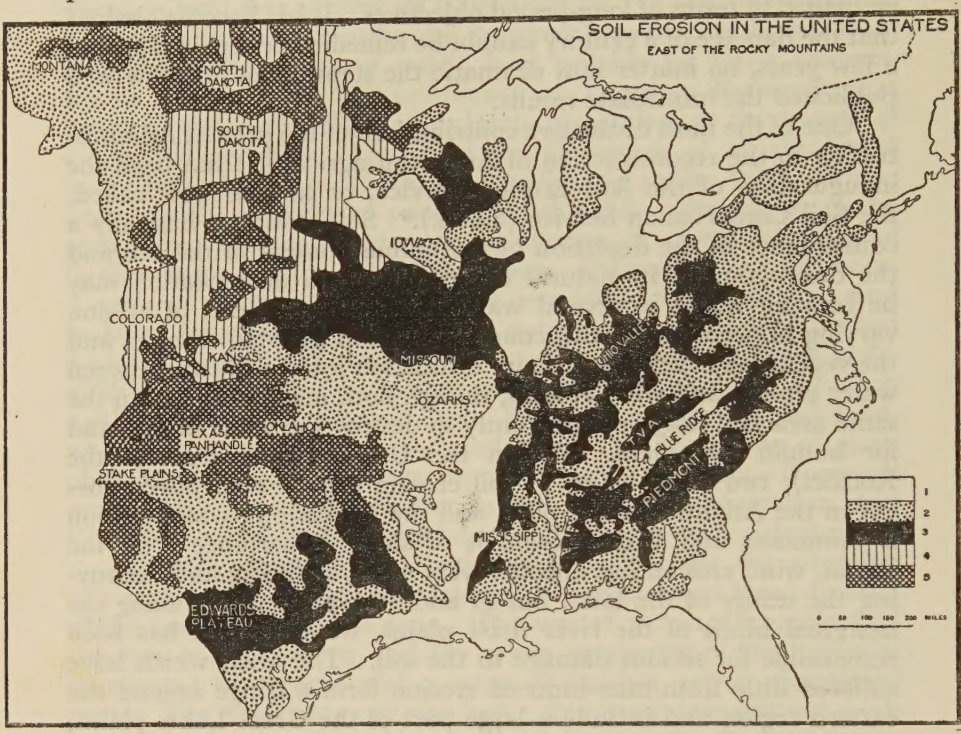
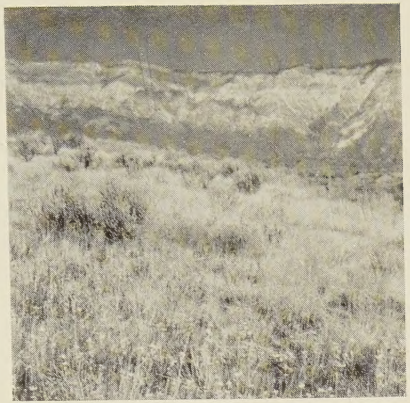


FIG. 1. (*Based on the supplementary report and map issued by the land and planning committee of the National Resources Board under the title, "Soil Erosion, a critical problem of American Agriculture."*)

KEY: 1. Land on which there has been no erosion of the soil, or where the evidences of soil removal are not greatly perceptible.

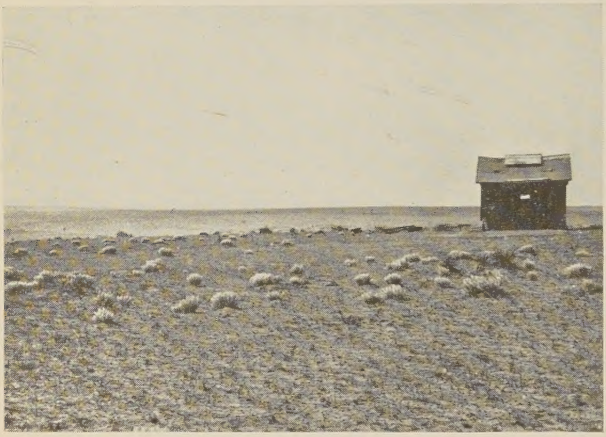
2. Slight to moderate erosion, with some sheet-wash, occasional gullies and, notably in the areas to the west of the Mississippi valley, some wind erosion.
3. Serious erosion by sheet-wash and gullying, in places more than 75 per cent. of the surface having been destroyed.
4. Slight to moderate erosion, mainly by wind, but with some sheet-washing and gullying.
5. Severe erosion, mainly by wind, but with sheet-erosion and frequent gullying in some localities, particularly in the south-west. Over large areas this class represents the effective destruction of the land for agricultural purposes.

South and the Cotton Belt. The troubles of the South are not new: some have their source in the economy of colonial days, and many of them are a consequence of the Civil War,[6] which, if it freed the negro, left the South enslaved to a ruined heritage. It was once a glad cry, "Cotton is King!", but the monarch has



PLATES 1 and 2. Sage-brush and bunch-grass range. Plate 1, the natural composition and density of the association ; Plate 2, the results of overgrazing, as reflected in the impoverishment of the vegetation and the erosion of the soil by wind and water.

PLATE 3. Gullying and soil slumping, consequences of overgrazing and the deterioration of the protective cover on a watershed.



PLATES 4 and 5. The Great Plains. Plate 4, protected by grass, a modification of their natural cover; Plate 5, eroded by wind, following attempts at dry farming.

PLATE 6. Contour ploughing and terracing on eroded cotton lands; the gullies in the middle-ground are beginning to heal in response to treatment.

proved a tyrant, exploiting the land and the people. The South, particularly the southern Piedmont, is pitted with eroded waste-lands, and elsewhere the farmers turn the unrewarding sub-soil and fight against declining yields with increasing applications of fertiliser. The land tragedy of the South has resulted in human waste and destruction : while a few large landowners have continued to enjoy the benefits of wealth, the mass of the population survive on a pittance, inadequately housed and fed, deprived of the hope of their lot improving, and discouraged by years of toil which have brought no reward.

Soil conservation will not furnish a complete cure for the troubles of this distressed area, but it is an essential foundation to other measures of social amelioration. Concentration on the cultivation of cotton, an exhausting crop, has led to the depletion of the mineral elements in the soil and to a weakening of the texture of such soils as are naturally susceptible of erosion. The open methods of cultivation leave the surface exposed to the heavy storm rains which are frequent in the summer months. Erosion, at first scarcely perceptible, begins with the removal of the top-soil but develops into rills which corrugate the surface of the fields and in the course of time unite to form larger gutters and gullies, carving the surface by deep gashes which branch and extend until there is no sufficient surface left to repay cultivation (Plate 3). Remedies are now being applied : surface washing is checked by contour ploughing, by terracing and by strip cultivation ; gullied land is reclaimed more slowly by the construction of check dams of timber and earth and by the planting of shrubs and trees. Some of this work is done directly by the S.C.S., but most of it has to be carried out by local cultivators with the guidance, advice and example of the service. The illiteracy, conservatism and poverty of the peasants and croppers are constant obstacles to the progress of remedial work.

On the Plains it is drought which has afflicted the people. Not once nor twice, but year after year, the crops have failed. The small farmers of the trans-Mississippi lands came from the East and the Middle West and they ploughed up the sod, hoping that grain would grow abundantly. Through the length and breadth of the United States, publicity men, Government men, harvester men and railroad men boomed the marvels of dry-farming which would free agriculture in the West from the necessity of irrigation. There were some good times during the War years, and it seemed that faith and credulity would be justified and effort and hardship rewarded. But in the 'twenties conditions took a turn for the worse, and in the 'thirties the land dried up and the soil began to blow away (Plates 4 and 5). The brown loam rose in whirling spirals and rolled along in clouds ; fine, yellowish dust fogged the sky, filled the air with scorching particles, or heaped itself in dunes which overwhelmed fences and buried farm-houses. The land has been stripped bare. A baked pavement of clay remains, wells have

been choked, the rivers are thick with silt, the cattle have died of starvation and thirst, no crops have come up, the houses have fallen into ruin, the windmills whirl uselessly until they break. Sooner or later the people have packed their pots and pans, mattresses and children, upon old cars and moved out to the East, the South, the West, escaping the destroying dust.

From across the Canadian border down through Montana and the Dakotas, Wyoming and Nebraska, eastern Colorado and western Kansas, into northern Oklahoma and the Panhandle of Texas, more than half a million square miles have been attacked by serious wind erosion, while almost the whole of the rest of the area embraced in these states has been affected by wind erosion, sheet-washing, and gullying to a greater or less degree (Fig. 1). While the drought of this decade has been the commonly accepted explanation of the severe dust-storms which have afflicted the Plains, the intensity of the drought and of its consequences are not due merely to a diminished rainfall. The deterioration of the water-holding capacity of the soil, following the reduction of the humus content, and the depletion of groundwater reserves, the accelerated surface run-off, and the decreased infiltration, have operated powerfully to make the effects of the drier years more serious than hitherto.

No one can say how long it will be before the western plains recover. One day the grass may come again to clothe the earth, and cattle range once more beyond the Missouri and the Mississippi. The Government can do comparatively little in the worst affected areas. In places the S.C.S. is sowing grass seed. Where a few people have clung on to their holdings, the Resettlement Administration is moving them out. The Bureau of Reclamation is improving the irrigation systems of the river valleys. In some of the better areas a great improvement has taken place as a result of the introduction of improved cultural practices and new rotations. But most must be left to Nature, to the rains and the native grasses which will slowly restore the soil texture and afford it a natural protective cover.[7]

In the intermontane West, stable settlement, encouraged by mining booms, advanced with the aid of stock-ranching and irrigation. Within twenty years of the earliest pioneer colonists, the destruction of the forests and the overstocking of the ranges began to take effect. The forests were cleared for timber, for fuel, for mining props, or were deliberately burned to encourage the growth of herbage which afforded summer range ; and with the destruction of the forests, erosion was accelerated. Indispensable irrigation works have been silted up and made ineffective, as the soil from the deforested mountains slipped down the slopes of the canyons and came tumbling out on to the lower lands, borne by floods which spread rock waste over the fertile farmlands. The increased cutting power of the streams in spate enables them to

redissect their alluvial fans and the mountain pediments, producing excessive drainage and placing beyond reach of economic irrigation some of the deep soil areas of the upper benches. These benchlands themselves become subject to erosion, and this is followed by a lowering of the level of the water-table, with a consequent deterioration in the vegetation. Sage-brush has increased its area at the expense of the more valuable grasses, and numerous species of low forage value, such as rabbit brush and cheat grass, have entered or enlarged their place in the association. Attempts at dry farming on the interfluve benchlands have resulted in costly failures. Good range has been destroyed and replaced by almost useless Russian thistle, and bare ground has been exposed to wind erosion. Recovery will be extremely difficult, for the rate of natural recuperation is slow and the cost of re-seeding large areas with suitable grasses is generally prohibitive on lands of low value.[8]

Though the restorative work of the S.C.S. is limited in its effectiveness, it is of value in preventing further extension of the damage. Each region presents its own distinctive problems and calls for a separate type of treatment, which involves usually some consideration of the whole economic and social complex. Farmers have been encouraged to adopt contour ploughing, to terrace their fields, to plant soil-conserving crops, and, where necessary, to take their land out of cultivation. Grazing on watersheds has been restricted or prohibited in the interests of the vegetation which is the most important means of stabilising the soil and preventing excessive surface run-off. The ultimate objective of the S.C.S. programme is to define the farm and range areas of the United States, and to control the utilisation of the resources of the soil in such a manner as to derive the fullest benefit from the land whilst protecting it from permanent injury. Such a programme is basic to the more general agricultural plan of the Administration, which is striving to establish an " Ever Normal Granary " and to balance the agricultural and industrial sides of American economy.[9]

In some of its functions the Forest Service overlaps the Soil Conservation Service, but the major responsibility of the older organisation is the conservation of the timber resources of the United States. The aim of the " Plan for American Forestry " is that the annual cut should not exceed the annual growth, and that timber production should become established as a permanent industry and not merely as an exploitive enterprise. But although the Forest Service controls a quarter of a million square miles of territory, this represents but one-fifth of the forest land of the country. The remainder is privately owned and its exploitation is still largely determined by considerations of immediate profit rather than by any long-period policy of conservation and sustained yield. Moreover, much of the land controlled by the Forest Service does not produce first-class timber, for it represents areas withdrawn from the public domain after much of the best forested country

had passed into private ownership. In the East, the National Forests have largely been acquired by purchase. In the West, large areas within the forest boundaries are scrubland and woodland. Despite these disadvantages, the Service is making an important contribution to forestry, both by its conservation of the land under its control and by the promotion of research on the management and use of timber.

But the work of the Forest Service is not limited to the conservation of the United States' timber resources, for the great tracts of country which it controls serve as game refuges, hunting areas, recreational zones, vital watershed lands and indispensable cattle and sheep range. In the intermontane and Pacific states, the National Forests now include most of the important watershed areas. From Washington to New Mexico and from California to Colorado, the life of the people is dependent on the waters which come down from the melting snows and from the summer storm rains of the mountains. Mining, industry, farming and stock raising make demands on this limited resource, and only by the protection of the drainage areas of the mountain streams will the maintenance of the existing modes of economy be possible. A cover of forest or scrub not only reduces erosion to the normal or geological dimensions, but retards run-off, increases infiltration to the benefit of the groundwater supply, and reduces the irregularity of river régimes. The need for storage works is lessened, the evaporation rate is lowered, the life of existing irrigation works is prolonged, and the utility of the precipitation is increased.[10]

The policy of the Forest Service, although primarily directed towards the conservation of timber resources and watershed values, has also contributed towards the stabilising of the western range livestock industry, for its activities affect a large part of the summer range country of the ranching states. In 1933, a million-and-a-half horses and cattle and six million sheep found summer grazing within the National Forests. But this aspect of the Forest Service's work was bound to remain incomplete while the public domain, which afforded complementary range for other seasons of the year, was subjected to unregulated use. This situation was remedied in 1934 with the passage of the Taylor Grazing Act and the establishment of the Division of Grazing. This division of the Department of Interior is charged with the regulation and control of grazing on the public domain, an area of half a million square miles in the West, which hitherto has been subject to competitive free use by the stockmen, who, having no legal title to the grazing, overstocked and abused the land, " mining " the forage. It is the policy of the Division of Grazing to put an end to this ruinous practice and to place the range livestock industry on a firm and modestly paying foundation. At present it is engaged in an intensive assessment of the resources of the range land and in the development of grazing practices which will ensure the maintenance, and where possible

the restoration, of the productivity of the annual forage crop from the natural pastures of the range. As far as possible the Division of Grazing has adopted the practice of co-operating with the stockmen themselves and of introducing reforms and regulations only after consultation with those most likely to be affected.[11]

Reference has already been made to the beginnings of the Park Service. With the improvement of the road net of the United States and the increasing use of the motor-car as a means of transport, these reserved areas assume great importance as holiday resorts for a population which is becoming increasingly urbanised. The Park Service has shown its responsiveness to the public needs by providing facilities and accommodation for all manner of tastes and means. The National Forests are also valuable recreational areas, and in 1931 it is estimated that their visitors numbered 32 million, or ten times the number passing through the National Parks, which are generally less accessible for many of the people in the eastern part of the country. The individual states are also making a contribution towards the preservation of areas of outstanding natural beauty and attraction, and in 1936 there were close on a thousand state parks and recreational areas, many of them covering no more than a few hundred acres, but some embracing more than 100,000 acres.[12]

Conservation is not merely a restrictive policy. The Government has from time to time undertaken projects to develop potential resources, particularly in the improvement of navigation, the development of hydro-electricity and the reconditioning and extension of irrigated areas. In the East, most of the power sites have been exploited by private enterprise, but in the West, where undertakings have to be on a larger scale, the indebtedness spread over a longer period, and in many instances the demand for power stimulated or created, the hydro-electric projects have been mainly, although not exclusively, undertaken by the Federal Government working through the Bureau of Reclamation. The activities of this Bureau have been orientated principally towards the improvement of existing works, but it has directed the construction of a number of large projects of which the most notable are Boulder Dam and the Grand Coulee Dam.[13]

Boulder Dam is one of a series of works designed to regulate and utilise more fully the waters of the Colorado River. Behind the dam is accumulated a volume of over 30 million acre-feet of water, or almost sufficient to cover the whole of England to a depth of one foot. The reservoir extends back for 115 miles from the dam, a great turquoise lake amid the browns and reds of the bare desert mountains. Water will be supplied for irrigation to the Imperial Valley and southern California, where the area of potentially valuable land could not be fully utilised under the existing irrigational facilities which left a large area inadequately and insecurely serviced ; the power (2 million h.p.) produced is being taken

mainly by Los Angeles, the only large centre within transmission radius of the dam (Plates 7 and 8).[14]

The Grand Coulee project is even more ambitious. Ninety

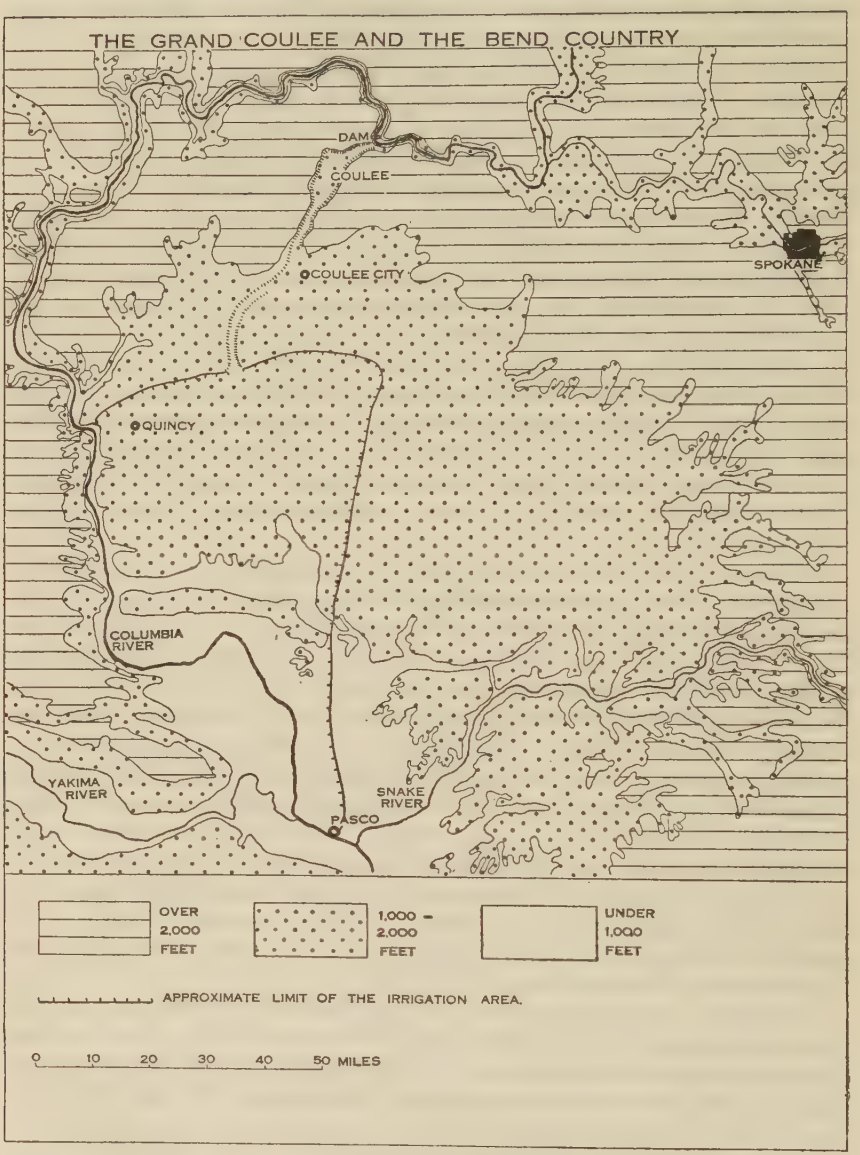


FIG. 2.

miles west of Spokane, the Columbia River flows through a gorge 1500 feet deep, cut into the lava plateau of the Great Bend country ; on the south side the gorge is notched by the upper end of the Grand Coulee, a tremendous glacial overflow channel etched in

the plateau by the Columbia when that river was diverted from its old course by the barrier of the southward extending ice sheet (Fig. 2). The retreat of the ice enabled the river to resume its former course, and the Coulee was left, a great dry corridor, in all fifty miles long with an average width of two miles and bounded by basaltic cliffs 600 to 800 feet in height (Plate 9). At its southern end the Coulee opens into the Quincy basin (average elevation 1200 feet), lying 700 feet above the Columbia River which forms the western and southern margin of the basin. Downstream from the northern end of the Coulee the Columbia River is being dammed. The finished barrage, 500 feet high and almost a mile across the top, will hold back a reservoir containing 5 million acre-feet of water which will extend upstream to the Canadian border, a distance of 150 miles. But the level of the reservoir will

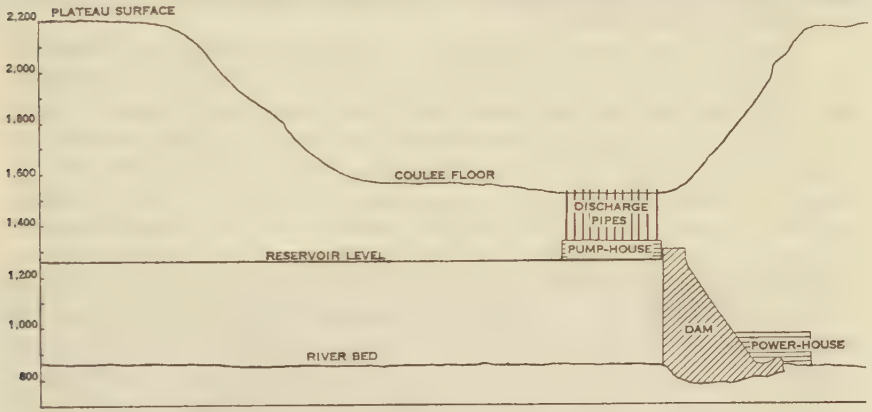


FIG. 3. Diagrammatic cross-section of the Grand Coulee Project, showing the relative positions of the dam, the reservoir and the upper end of the Grand Coulee.

still be 280 feet below the floor of the Grand Coulee, to which the water will be lifted by a battery of electrically driven pumps capable of raising 16,000 cubic feet of water per second (Fig. 3). The upper part of the Grand Coulee itself will be converted into an auxiliary reservoir, twenty-three miles long, while the lower part will carry the main distributary canal, which will lead the water down to the Quincy basin (Fig. 2).

The Grand Coulee scheme is planned to bring into cultivation more than a million acres, much of which is land settled in the early part of the century and since abandoned by over-optimistic farmers who thought that they would be able to produce crops from this semi-arid region without the aid of irrigation. The land, most of which is of high fertility, will be recovered for agricultural use. Settlement is planned to begin in 1942 with holdings ranging from 80 to 160 acres, and it is estimated that it will be another thirty years before occupation is complete ; it is anticipated that

the area will eventually have a population, rural and urban, of 300,000. A hydro-electric plant capable of developing 2,500,000 horse-power is to be installed at the dam ; this power will be used in part by the pumping plant, but most of it will be sold in the states of Washington, northern Oregon and Idaho. The proceeds will contribute largely to the liquidation of the hundred million pounds sterling expended on the project. Up to the present, research has been mainly devoted to the technical problems of engineering and irrigation, and to agronomic surveys of the land's potentialities ; it is to be hoped that before settlement is allowed to begin, the more elusive problems of regional planning and social integration will be examined. The Department of Interior has already taken steps to prevent land speculation, but the future stability and well-being of the settlers and their region demands more than this prohibition and calls for a broadly conceived policy of regional development.[15]

These tremendous engineering works are massive monuments of twentieth-century achievement, but one is prone to wonder wherein lies the logic of a land utilisation policy which spends part of its effort in reducing agricultural surpluses by crop restriction while another agency is busy expanding the cultivable area of the state. The Boulder Dam is not primarily designed to add greatly to the acreage of irrigated land but rather to give a more assured supply of water to existing farm communities. But the size of the project was conditioned by considerations of hydro-electric development, and when one surveys the sparsely peopled hinterland of the dam it is difficult to conjure up a picture of the potential market which will be capable of absorbing the large surplus of which Los Angeles has no need. While Boulder Dam and Grand Coulee are admirable examples of governmental efficiency and technical ability, they are not such certain recommendations of its wisdom. By this it is not intended to condemn the projects of themselves, but to call in question the fundamental soundness of policies of crop restriction which are conceived within the narrow framework of economic reference and do not envisage the more enduring benefits of regional balance.

The largest conservation works of the Government are to be found in the West, but the most significant is in the East. The Tennessee Valley project represents a most important experiment in Government-directed regional planning. Under the terms of the 1933 Act of Congress, amended in 1935, the Tennessee Valley Authority (T.V.A.) is charged with the comprehensive development of the entire drainage basin of the Tennessee River, an area of 40,600 square miles, which is 10,000 square miles greater than the area of Scotland. It was the necessity of solving the problems of the Mississippi floods and the desirability of developing the inland waterways of the country which enabled the Federal Government to overcome the constitutional difficulties arising from the

PLATE 7. Boulder Dam, with the power-house at its base.

PLATE 8. Lake Mead, the reservoir behind the dam.

PLATE 9. The Grand Coulee, viewed from the south. This part of the Coulee will be occupied by the auxiliary reservoir, above which Steamboat Rock (middle background) will rise as an island. The greasewood vegetation is indicative of the aridity of the climate and the alkalinity of the soil.

conflict between state rights and the legitimate field of federal action. The interests of national defence were also advanced as justifying this enlargement of the sphere of the central administration. Much of the friction which might have ensued in a battle over state rights has been avoided by inviting the co-operation of the states concerned in the scheme. While river control is legally the major responsibility with which the Government agency is charged, it is the supplementary aspects of its work which are of greater significance and which have aroused most interest and controversy.

The T.V.A., a Government corporation, is responsible for the improvement of river navigation, the control of floods, the generation of hydro-electricity, the conservation of the soil and forest resources, and the rehabilitation of the people. The completion of a nine-foot channel on the Tennessee River as far as Knoxville adds some six hundred miles to the inland waterway system which extends from the Gulf of Mexico up the Mississippi into the heart of the continent. The regulation of the run-off and river flow contribute greatly to reducing the incidence of the destructive floods which have been experienced in the Mississippi valley. At the controlling dams along the Tennessee, 166,000 horse-power of electricity have been developed. The new energy is being used in factories, in homes, on the land, and in the production of nitrates and super-phosphates. These chemicals are retailed to the farmers to enable them to restore its fertility to the impoverished soil, improving the yields of crops and the quality of livestock. Many families in the Valley have been re-housed, co-operatives have been established, schools and social services have been improved, farming methods have been changed, new crops introduced, and industry has developed. The whole structure of life in a predominantly rural area has been placed upon a stable and enduring foundation. This well-conceived development of the region is a model which may yet be applied on a wider scale elsewhere in the United States, and it is an example which we might consider when seeking a remedy for the plight of the distressed areas of Britain. Under the T.V.A., we see the practical application of the conservation principle in its widest implications, embracing not only the natural resources and their utilisation, but also the welfare of the people who depend on them and their beneficial use for a livelihood. The geographical region has become the administrative and economic unit, and the whole complex begins to function as an integrated entity.[16]

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DIFFUSED LIGHT AND SUNLIGHT IN RELATION TO RELIEF AND SETTLEMENT IN HIGH LATITUDES

By Alice Garnett

The characteristics of the human geography of mountain valleys are to a large extent determined by the interplay of varied and often complex factors of the physical basis, structural, morphological, and climatic. From the standpoint of climate alone, slopes at high altitudes produce specialised local controls on the régimes of temperatures, precipitation, and air circulation; but in addition, an indirect influence of no small geographical significance is the distribution of sky light, and of sunlight, in so far as the latter is determined by the extent and frequency of mountain shadows thrown across valley-bottoms and valley-sides as the sun passes behind high peaks or abrupt mountain shoulders. In high alpine regions the significance of this factor has long been recognised by geographers, since the difference between sun and shade temperatures increases so noticeably with increasing altitude.[1] The present discussion attempts a preliminary analysis of the influence of relief at comparatively low altitudes but in high latitudes, as exemplified by the valleys of the Highlands of Scotland.*

Both types of environment, " Highland " and " Alpine," show strongly glaciated surface features, but there are marked contrasts in their settlement patterns. In the alpine regions (for example, of central and parts of southern Europe) there exists the " law of *adret* and *ubac* "—*i.e.* that villages are placed on south-facing (*adret*) slopes, while the *ubac* (north-facing) slopes are frequently counted as of secondary or supplementary value and either are left in forest and uninhabited or are but sparsely occupied and farmed. In the Highlands of Scotland there is nothing directly comparable to this distribution on a widespread scale, though it may be exemplified locally. As a general rule it may be said that no longer are there chains of hamlets or of arable land or meadow set almost exclusively on the northern valley-side. Instead, north-facing and south-facing slopes are often equally used, while sometimes neither side is used and the valleys are left unoccupied and given over to rough pasture ; or—what may at first seem an unexpected feature—sometimes it is the *south* side of the valley (*i.e.* the *ubac*) which provides the site for the occasional hamlet or farmstead.

Admittedly there are many factors involved ; as, for example, soils, distribution of alluvium, drainage, accessibility and facilities for communication, degree of slope, and so on ; or again non-geographical factors such as historical influences, or external and internal economic and social influences concerned with questions

* The term " Highland " as distinct from " Alpine " is used in the following pages as referring to this particular environment.

of land ownership and tenure, or the peculiarities of Scottish farming traditions.[2] In the present study discussion will be limited to a consideration of that factor which has hitherto received probably least separate attention, *viz.* the influence of relief on the available radiation income received from both diffused light and sunlight.

Relief can interfere with the radiation income in three ways. In the first place, " mountain shadows " curtail the *duration* of sunshine on unfavourably placed slopes. Secondly, variations of slope and of aspect affect the *intensity* of surface heating. In a very short distance slopes may change so suddenly that closely adjacent portions of a valley-side may receive less than 10 per cent. and over 90 per cent. respectively of the available insolation. It has been shown for a number of alpine valleys that high potential *duration of sunshine* rather than high *intensity of surface heating* seems to be the factor more generally of importance in determining the exact location of settlements and the upper limit of crops.[3] Can this be demonstrated as being true also of highland regions in high latitudes ? Thirdly, relief obstructs the sky hemisphere so that varying amounts of diffused sky lighting are received on different slopes. Day by day this loss remains constant in proportion, though not necessarily in quality, since the latter is determined by changing atmospheric conditions. On the other hand, the influence of relief on potential sunlight distributions and intensities is continually changing with the movements of the sun.

In any comparative study of the effects of these three forms of topographic interference certain fundamental differences of the " Highland " as compared with the " Alpine " environment should be kept well in mind.

(1) The Scottish Highland valleys occur at low, not high, altitudes, *i.e.* at the base of the atmosphere, where, as noted, the contrasts of sun and shade temperatures are at a minimum.

(2) For the most part, Highland relief repeats—but on a miniature scale only—the glacial land forms of high alpine relief, so that the obstructive effects are in many cases either far less pronounced or more localised. The smaller scale of the relief features in a Highland valley gives the changes of sunlight duration a smaller pattern and a finer gradation than is common in alpine regions.

(3) Its regional setting gives the North-West Highlands a climate with skies frequently overcast, high air humidity and heavy precipitation. From this factor alone, two important points emerge. Firstly, the *actual* sunshine duration is far below the *potential* duration for the latitude. In a recent publication of the Meteorological Office,[4] comparison is made of the potential sunshine duration for different latitudes (as determined astronomically) with the actual sunshine records for the British Isles. Some of the records relevant to the present enquiry are tabulated below. The first three columns show the theoretical duration of sunshine for the seasons and latitude discussed, and make an interesting comparison with the

potential sunshine calculated for the maps of Figs. 4-11. The remaining columns record the *actual* duration of sunshine. The winter readings for Fort Augustus are especially striking, showing that an average of only 6 and 8 per cent. (in December and January respectively) of the total possible sunshine duration was received.

Mean Daily Potential Duration (in hours).				Actual Recorded Duration for Two Highland Stations.			
				Fortrose.		Fort Augustus.	
(1) Lat. 56°	(2) Lat. 58°	(3) Lat. 60°	Month.	Daily mean in hours.	Per cent. possible duration.	Daily mean in hours.	Per cent. possible duration.
7·6	5·18	6·7	January	1·45	20	·61	8
9·48	9·26	9·0	February	2·45	26	1·72	18
11·75	11·73	11·7	March	3·75	32	3·22	28
14·11	14·28	14·47	April	4·80	34	3·37	27
16·21	16·60	17·03	May	5·49	33	4·43	27
17·41	17·94	18·69	June	6·14	34	4·68	26
16·88	17·34	17·88	July	5·20	30	3·75	22
16·01	15·26	15·56	August	4·36	29	3·46	23
12·74	12·30	12·86	September	3·89	30	3·36	26
10·40	10·26	10·12	October	2·98	29	2·20	21
8·24	7·90	7·51	November	1·88	24	·99	12
6·98	6·49	5·93	December	1·25	17	·41	6

Secondly, the high atmospheric humidity is associated not only with cloudy skies but also with heavy precipitation, much of which comes as rainfall. Now it is this rainfall, perhaps more than sunshine, that is responsible for the rate at which snow melts in the Highlands [5]; slopes are therefore often cleared of snow without regard to their aspect, south-facing or north-facing as the case may be. In alpine regions, on the other hand, the high intensity of sunlight frequently results in the date at which slopes are cleared being governed most markedly by their exposure to long or short periods of strong insolation. This is one of the several geographical reasons accounting for the significance of the sunshine distribution at high altitudes in helping to determine the distribution of alpine settlements.

(4) Finally, the important effects of differences of latitude must be borne in mind. In the Scottish valleys higher latitude causes lower sun altitudes, which are most pronounced in the winter season. This difference in sun altitude brings well-marked seasonal differences in the lengths of day and night, and also in the bearing of the sun's rays and therefore in the direction from which mountain shadows are cast at different seasons of the year. In winter, sun altitudes are so low, even at noon, and days so short, that a com-

paratively low barrier of obstructing relief may reduce the potential sunshine income to zero. On the other hand, at the summer solstice days are greatly lengthened, and bring an increasing frequency of rays orientated from a direction well to the north of east and of west (*i.e.* before 6 a.m. and after 6 p.m.). With the advance of summer, therefore, an increasing proportion of shadows are cast *southwards* from more and more northerly sun rays.

It is perhaps more important, at low altitudes in high latitudes, that the low sun intensity during a considerable part of the year results in an increasing part of the radiation income received on any surface being derived from diffused sky light rather than from sunlight. It is difficult to assess the relative importance geographically of these two sources of the radiation income, and in any case the value of diffused light from the sky is subject to rapid and wide variations according to chance meteorological conditions. For instance, in studies of the interdependence between the amount of diffuse sky radiation and the duration of sunshine, W. Gorczynski [6] has shown that the highest values in the daily amounts of sky radiation are observed for days when the meteorological conditions give only *one-quarter* of the possible duration of sunlight. These maxima are frequently more than twice as great as the corresponding amounts registered for days when the sky is either totally covered or perfectly clear, when, surprisingly enough, the diffuse radiation differs very little in average amount. For high latitudes, Ångström [7] demonstrates that on a horizontal surface at Stockholm (lat. 59° 21′ N.), the proportion of the total radiation income derived from the *sky alone* varies seasonally thus :

December	January	March	June	October
·91	·79	·37	·23	·61

At Stockholm, therefore, for half the year the diffused light alone accounts for more than 50 per cent., and in the winter months for more than 80 per cent., of the radiation income.

Again, the higher the latitude, the longer the period during which the radiation of weak, diffused light may take place from a sky faintly illumined by the twilight prevailing after sunset and before sunrise.

These facts suggest that the influence of relief on the diffused light income should be considered as a geographical factor no less important than the influence of relief on direct sunlight. By botanists the importance of variations in diffused light in relation to plant growth and distributions has long been recognised.[8] Figs. 14 and 15 show how considerable may be the area of sky light intercepted. For the section shown in Fig. 14, at the station X, diffused light is available only from within the arc QXR, and it is clear that in relation to this factor the differentiation of *adret* and *ubac* slopes, as such, no longer has significance. A steep, south-facing slope may easily be at a disadvantage, losing more than a valley-bottom or a

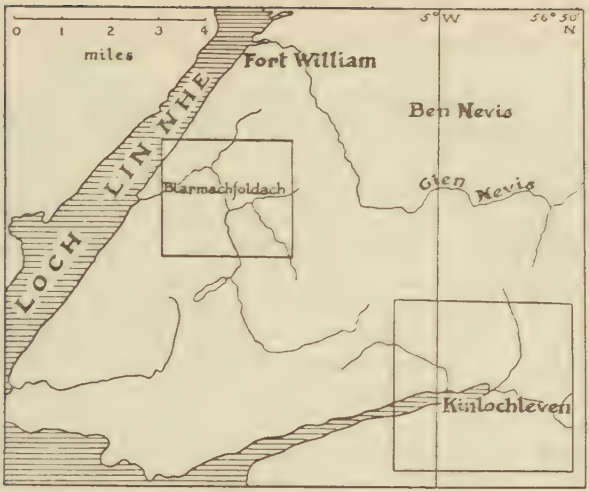


FIG. 1. Index to the relative positions of the regions discussed.

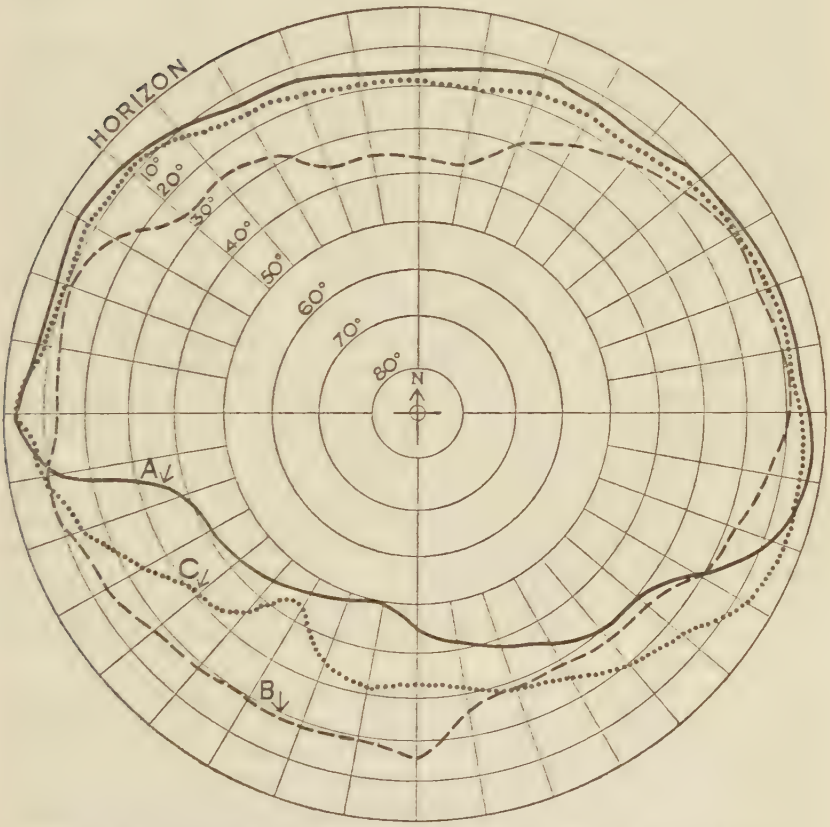


FIG. 2. Chart to show the relative areas and pattern of the sky from which the diffuse light income is obtained, as a result of the influence of relief.

A. Steep *ubac*, Kinlochleven, 38 per cent. loss.
B. Steep *adret*, Glen Nevis, 37 per cent. loss.
C. Valley floor, Kinlochleven, 27 per cent. loss.

more gentle north-facing slope. The most favoured localities will be those most remote from the steep valley-sides—*e.g.* the central parts of glaciated U-valley bottoms.

A method has been devised for calculating the varying amounts of diffused light lost as a result of topographic interference. It consists in plotting for definite stations, on Azimuthal Equal Area Projections, the portion of the sky hemisphere which is unobstructed.* Fig. 2 shows the area of unintercepted sky for three stations. Station A lies at the foot of the *ubac* slopes of Kinlochleven; C lies on the valley-bottom only some 200 yards north-east of A; while B lies on the *adret* slopes of Glen Nevis, a neighbouring valley to the north. A (*ubac*) and B (*adret*) lose 38 and 37 per cent. respectively of the available diffused light income. C, though so near to A, loses only 27 per cent. In each case these are, of course, permanent losses day by day throughout the year, whether the diffuse light be strong or weak, and they may be regarded as typifying, for both *adret* and *ubac*, characteristic conditions in the deeper Highland valleys. Other cases will be considered later.

For potential sunlight, maps and some graphs have been included to show the degrees of topographic interference for two small regions. Fig. 3 shows the wide contrasts in the potential insolation income for three definite stations in the Kinlochleven area (see Fig. 1 and Figs. 4-9), *viz.*: an *adret* station on the south-facing slope at a height of 1500 feet; a "valley" station at Kinlochleven; and a *ubac* station at 1300 feet. For the first there are three curves, because at this higher altitude sunshine can penetrate at all seasons of the year. For the valley station only two curves can be plotted, since the valley is filled with shadow in winter. For the *ubac* only one curve is shown, because at the particular point selected there is hardly any potential sunshine available, even at the equinoxes.[9]

These curves draw attention to two points: (1) The difference in the strength of the sun is shown by the difference in the height of the three curves portraying conditions at the one station. (*Vide* the *adret* curves for winter, the equinoxes and summer.) The extremely low winter values of sunshine are indicated by the winter *adret* "curve" between the points X-Y. Not only is the curve restricted to this length, but also the curve should rise in height only to one-tenth of the maximum thickness of the line XY, if shown correctly to scale, as compared with the summer curve for the same station.

(2) The effects of relief in altering the form of the insolation income *at the same date* are shown by comparing the three curves calculated in each case for the summer solstice. The *adret* curve rises highest but is narrowest (*i.e.* marks shortest duration); the Kinlochleven "valley" curve is transitional, while the *ubac* summer curve shows, in its much lower height, a weak intensity of heating, but at the same time a much longer period of sunlight. (These

* See Appendix.

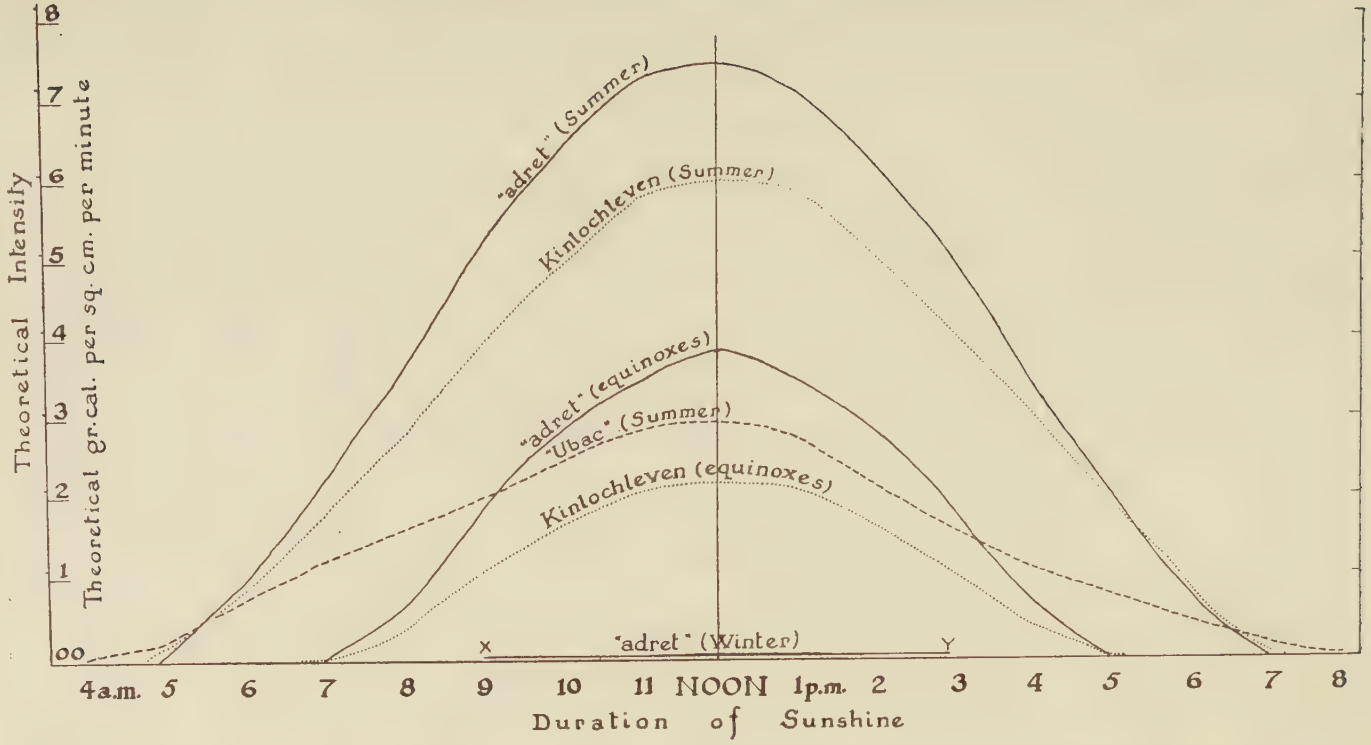


FIG. 3. Graphs to show the changing influence of relief on the duration and intensity of insolation at different seasons of the year.

curves are calculated according to accepted meteorological averages, so that the differences in form and area express solely the effects of relief in relation to changing seasonal conditions.)

It has already been noted that there is a 30-40 per cent. loss of diffused light on parts of the flanks of Loch Leven. The maps (Figs. 4-9) show to what extent potential sunlight values intensify or compensate for these conditions. In winter no sunlight can ever penetrate to the valley-bottom, giving, therefore, no advantage to *adret* or *ubac*. By the equinoxes the valley-bottom and the *adret* are clear of mountain shadows, though the *ubac* is still liable to a considerable loss of sunlight; indeed, locally almost all sunlight is lost. But in summer, *i.e.* during most of the growing season, the effects of high latitude lead to a reversal of the values normally associated with north- and south-facing slopes. It is now the *ubac* which has the longest duration. The *adret* obstructs the early morning and evening rays that strike from directions north of east and west. Though it may be argued that the heat value of such rays is low, because of the low sun altitudes at these times, their light values may in terms of plant processes be of no small significance in an environment where light values are restricted in so many other ways. These maps therefore exemplify an important principle that may be applied widely in mountain regions in high latitudes (and especially in east-to-west valleys that are wide deep troughs), namely, that the *ubac* and not the *adret* is, in terms of potential sunlight, the part of the valley that will probably receive the longest duration of sunlight during the major part of the growing season, while in winter there may be nothing to choose from this standpoint between the two valley-sides. It will be noticed that this particular valley is not conspicuously associated with agricultural activities—a fact not surprising in view of the points noted. The dominant human interest is at present connected with the *ubac* industrial township of Kinlochleven, unusual as a Highland settlement type and concerned with local supplies of hydro-electric power and the growth here of the aluminium industry. Fifty years ago, however, there were eighteen crofter families in the valley between Kinlochleven and North Ballachulish, where to-day there is scarcely one. Under the indifferent agricultural conditions present, the competition of local industrial and other external factors has led to the deterioration of the land to rough pasture.[10]

By contrast, the region of Blarmachfoldach, although only a few miles distant, portrays quite different conditions in both topography and land utilisation. Here there are valleys orientated from both north-to-south and east-to-west, set within relief of far more subdued character. In addition, it is a region where agriculture still persists in spite of many factors—geographical and otherwise—which have led to so much Highland depopulation. The maps (Figs. 5, 6, 10, 12) show that two slopes are used, one south-facing and the other west-facing, and at first glance the notable use of the

south-facing slope seems a clear case of the effective selection of a sun-facing slope up to heights unusual in Highland farming. Old records [11] show the division of "Blairmacphaoildeachd" as including the largest amount of arable land, though amongst the divisions of the "Lordship of Lochaber" it was neither the largest in area nor that possessing the lowest proportion of hill surface. This division covered the northern parts of the *west*-facing slope—not the south-facing cleared surfaces. In all the valleys of this little region, up to an altitude of about 1000 feet, there is a complete mantle of drift covering the Ballachulish slates and limestones which form the basal structure. This is true of all slopes, whether they face eastward, westward, or southward. There is no evidence to suggest that the limits of cleared land, as distinct from rough pasture, are related directly to changes of rock or soil types.

At present some of the farmland seems to be deteriorating, most noticeably on parts of the south-facing slope. Only a part of the area on these cleared slopes is used as arable land or as meadow. On both south- and west-facing slopes *above* the road, land is given almost exclusively to permanent hay or to rough pasture. On the slopes below the road the land use shows a little more diversity, since small plots of oats, potatoes and vegetables are interspersed amongst the fields of permanent hay. But again, here and there the latter has reverted to rough pasture, most noticeably on the south-facing slope, where, too, there is the least variety and least area of crops.

The sun duration maps are given for the winter and the equinoxes (in summer there is very little interference by relief). Figs. 5 and 10 show that there is marked contrast as compared with the Kinlochleven area (Figs. 5 and 7). Many parts of the Blarmachfoldach slopes receive as much as four hours of potential sunlight in midwinter. In spring and autumn potential sunlight values are again reasonably high on these slopes, but they are not actually so high as those of the valley-bottom and *adret* slopes in parts of the Kinlochleven region, where the determining pattern of relief is quite different. Consideration of conditions at the equinoxes and in winter suggests that in the Blarmachfoldach region potential sun values are high, but that the area most continuously favoured with sunlight lies not within the farmed area of the west- or south-facing slopes, but on the *adret* east of the latter, at a height of about 750 feet. In short, it is rather in a general degree only that one can correlate the old farming settlements of this locality with areas of most favourable sunshine duration. The associations here cannot compare in degree with that extremely close and striking correlation which so frequently characterises alpine settlements. Were this locality part of an alpine environment we should expect in terms of sun values to find a far greater use of the south-facing slopes that extend *eastward* in the region left to rough pasture, and a smaller use—if any—of the west-facing slopes where sun values are lower.

It is of interest, and perhaps some significance, that the local farmer of these regions says that there is *too much* sun on some of the south-facing slopes. This suggests the need for a close investigation of the influence of relief on the diffused light for this region, and the construction of sky charts shows that not only is the area comparatively sunny in terms of potential duration, but also that the general diffused light income is greater on these slopes as compared with those of more mountainous regions (*e.g.* Kinlochleven). Three stations are illustrated in Fig. 13, one at the only point on the south-facing slopes where crop cultivation occurs (B), a second where the area is left to rough pasture, though on a good south-facing slope in terms of potential sun-duration (A), and one in the area of mixed cultivation on the west-facing slopes (C). The diffused sky light is obstructed by different hills, in each case to varying degrees, as the interlacing of the sky projections shows. In view of the land utilisation at these three stations it is of interest to note that B and C—though different in aspect—have almost identical diffused light incomes, with a loss of only 12-13 per cent. in each case. A, on the other hand—though occupying a site apparently similar in many respects to that of B, yet in the zone of rough pasture—is hemmed in more closely by hills both north and south, with the result that the diffused light income shows a loss of 25 per cent. (*i.e.* double that at B and C). The Blarmachfoldach farmed land may therefore be regarded as including those surfaces which most nearly obtain both a favourable sunshine and a favourable diffused light income. The low percentage of actual as compared with potential sunshine that is normally received according to meteorological records (and therefore the high percentage of diffused light on which vegetation must largely depend) adds special significance to the figures quoted for the three stations. Is it to variations in this last factor that the persistence of farming in the Blarmachfoldach region as compared with its decline in the Kinlochleven region and similar valleys nearby should more especially be ascribed?

This discussion is not intended as postulating the single or necessarily a dominant factor influencing the distribution of agrarian settlement in the Highlands of Scotland. Geographers, however, should isolate for separate assessment all factors of the environment before generalisations are made regarding any one of them. The above few illustrations are intended, first, to suggest lines along which future detailed investigation might be made in so far as the study of this particular light factor is concerned; and second, to emphasise the danger of premature generalisation, since they demonstrate the variety and rapidity of the changes in the nature of the radiation income brought about solely by the influence of relief. Third, they reveal the fallacy of assuming that in high latitudes south-facing slopes are always those most favoured in every respect. From the standpoint of neither sun duration nor diffused

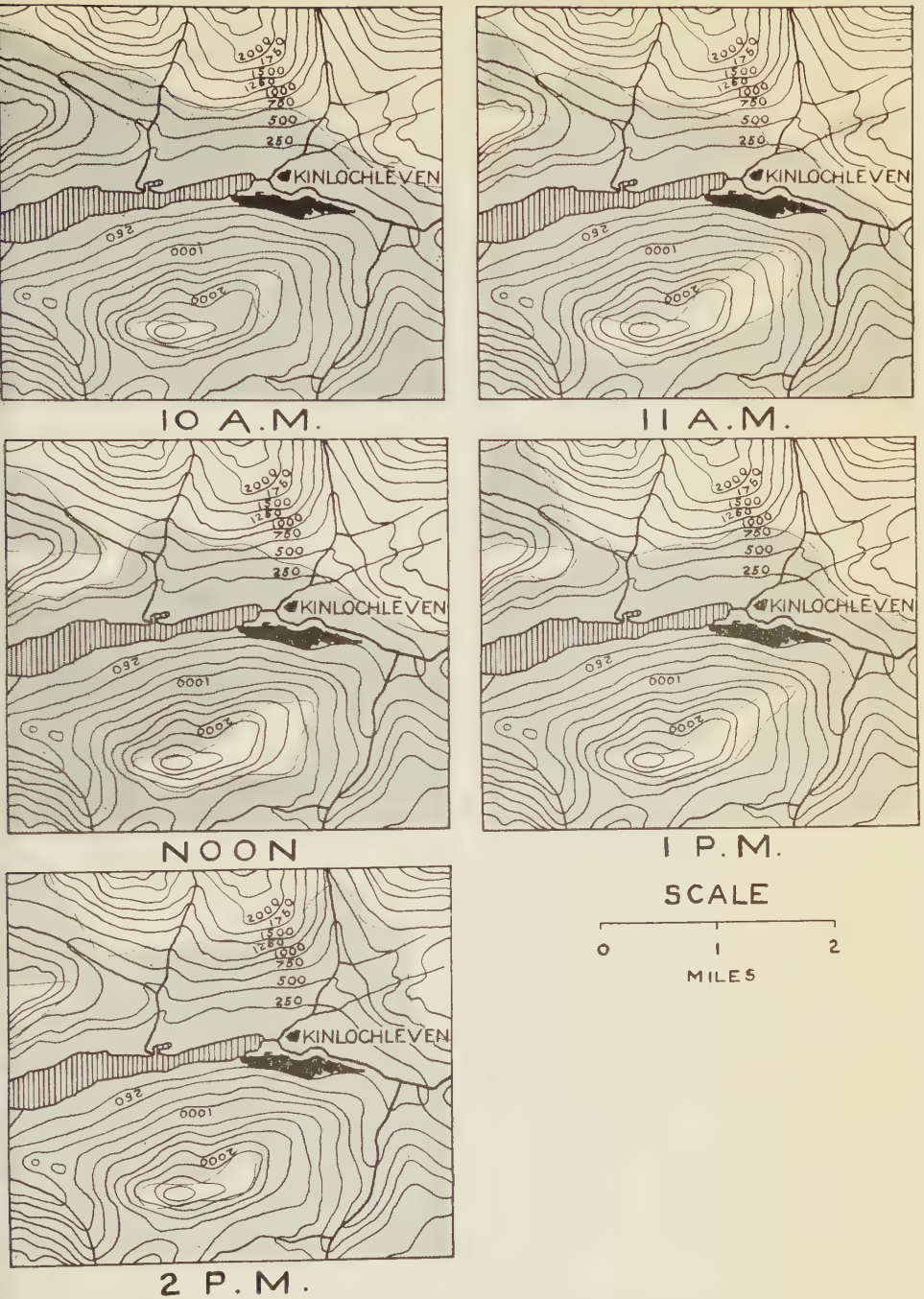


Fig 4. Hourly shadows at midwinter, from 10 a.m. to 2 p.m.

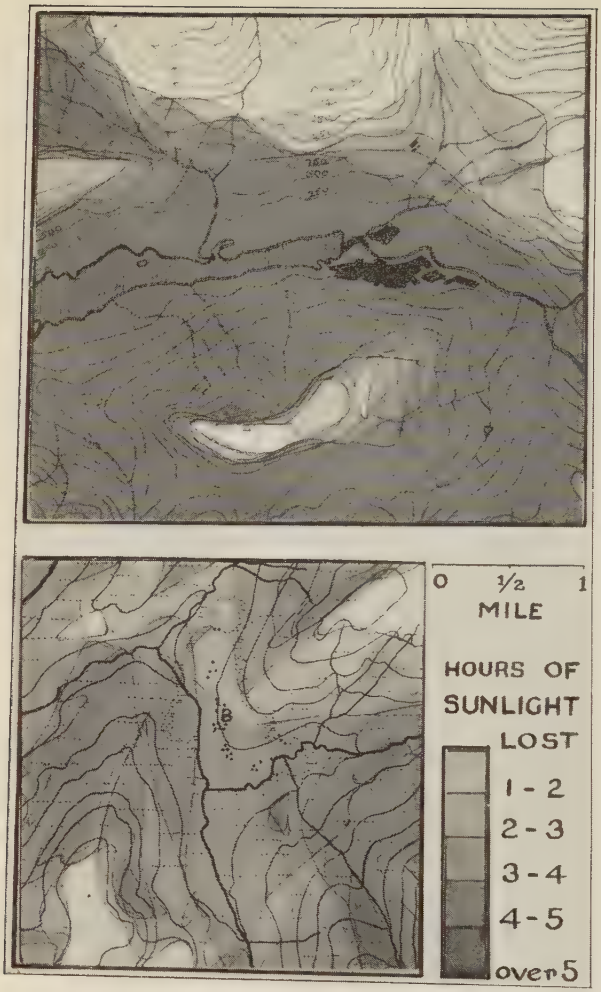


Fig. 5. Potential duration of sunlight at midwinter, Kinlochleven (above) and Blarmachfoldach (below).

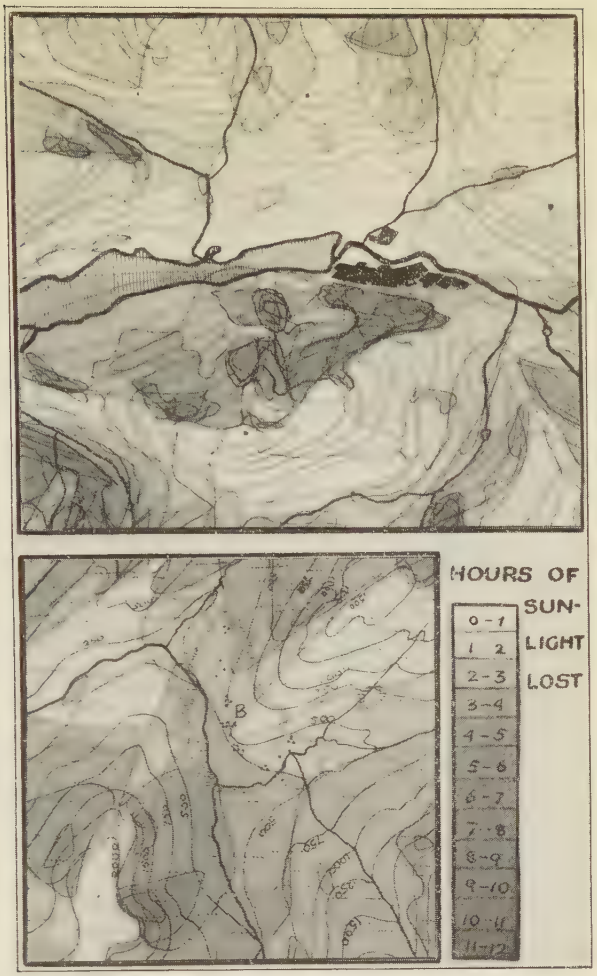


Fig. 6. Potential duration of sunlight at the equinoxes.

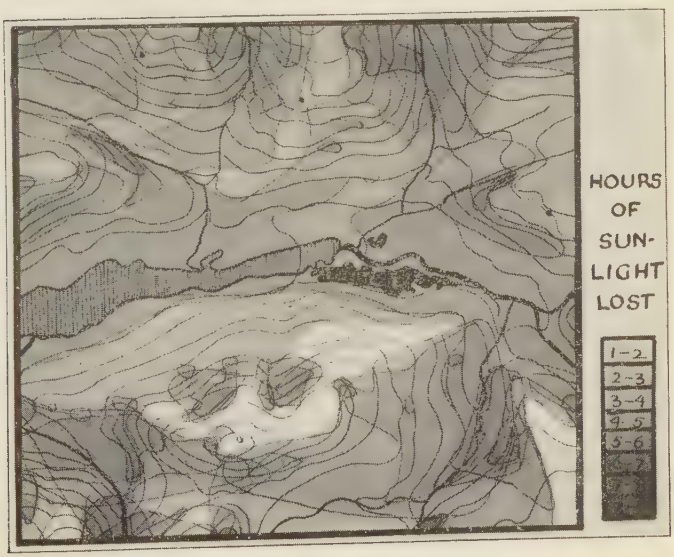
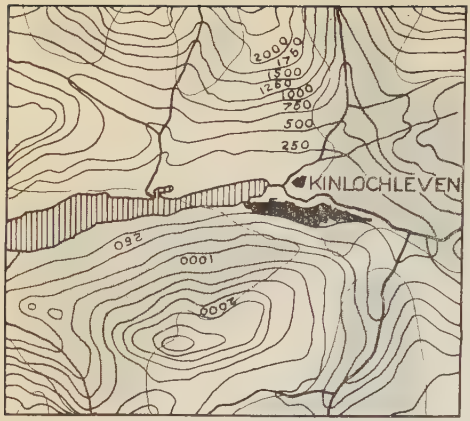


Fig. 7. Potential duration of sunlight at midsummer (Kinlochleven).



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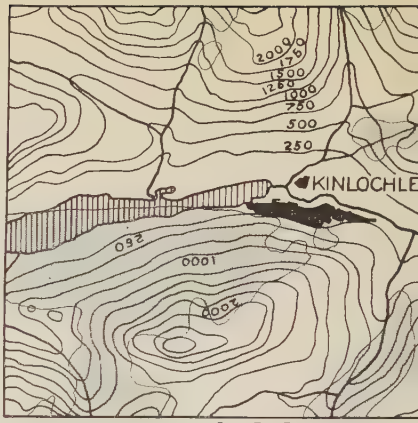

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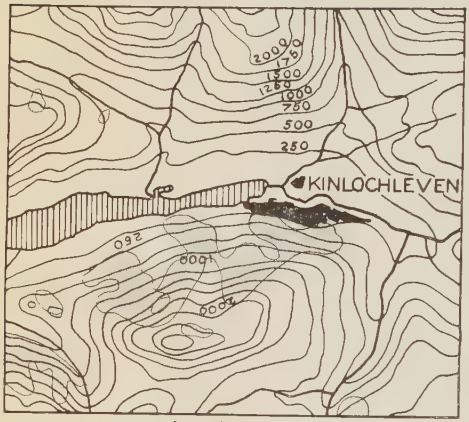

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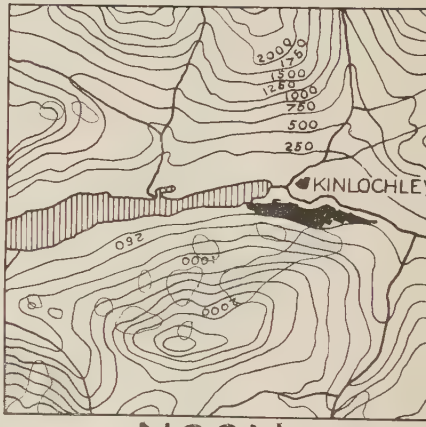

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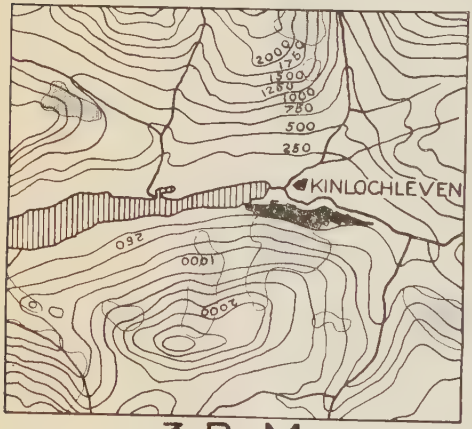

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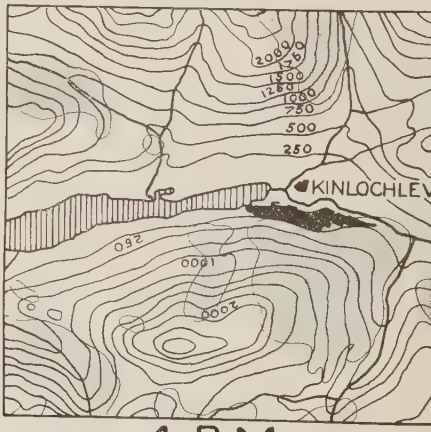

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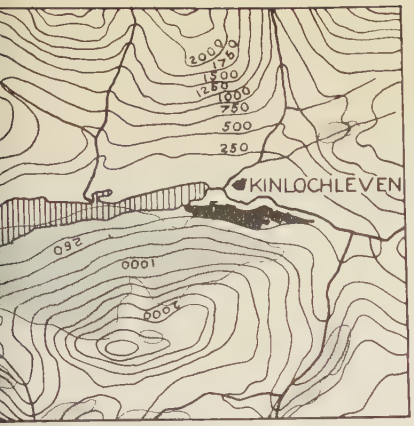
FIG. 8. Hourly shad



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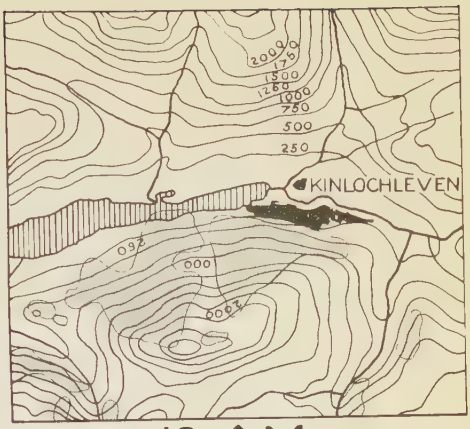

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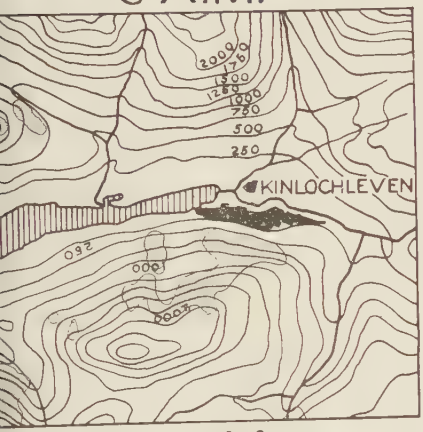

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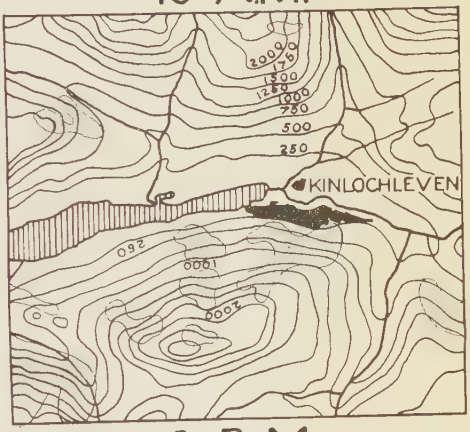

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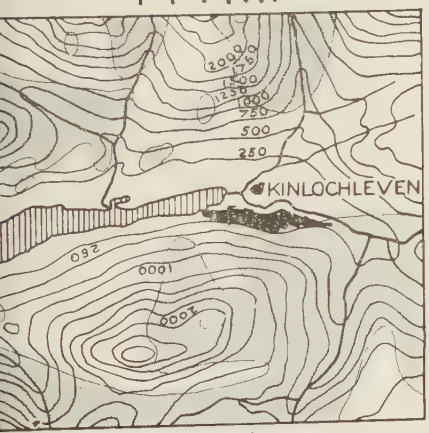

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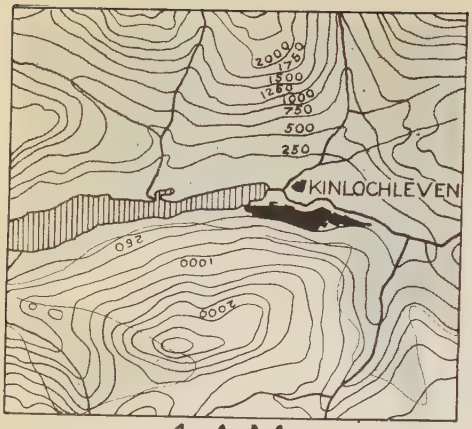
e equinoxes.



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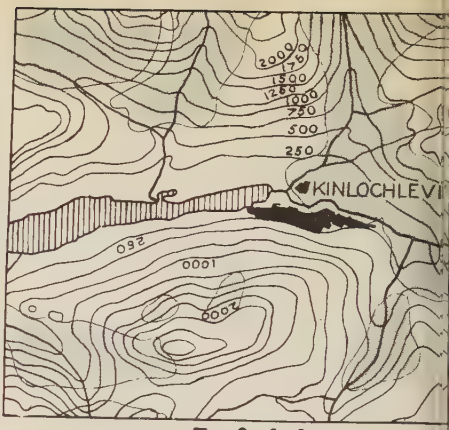

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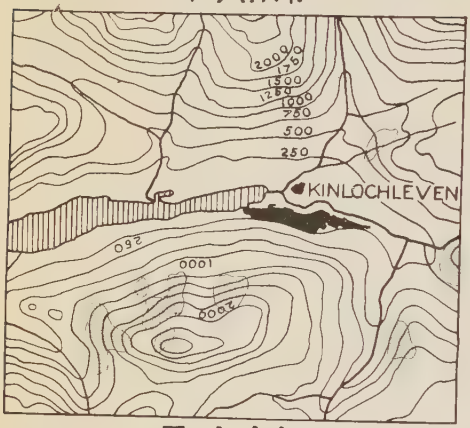

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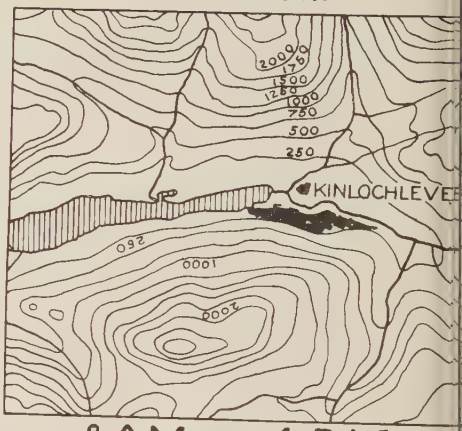

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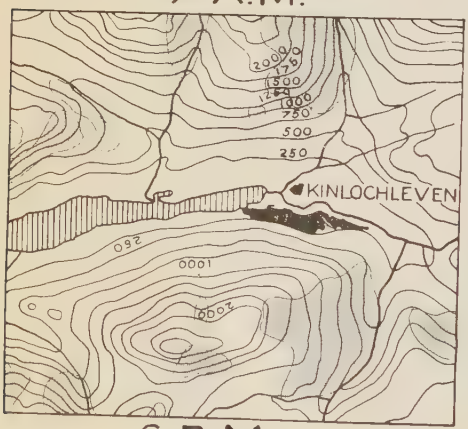

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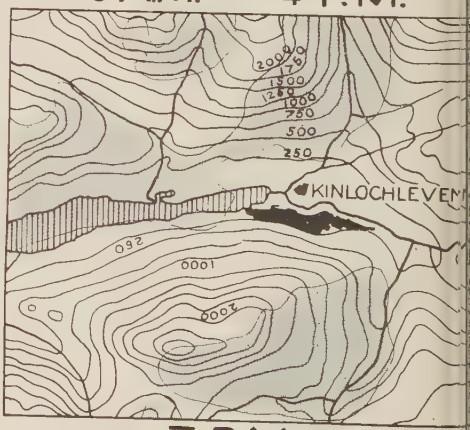
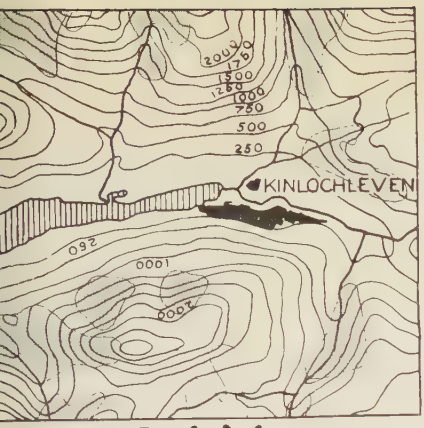


7 P.M.

FIG. 9. Hourly shadow



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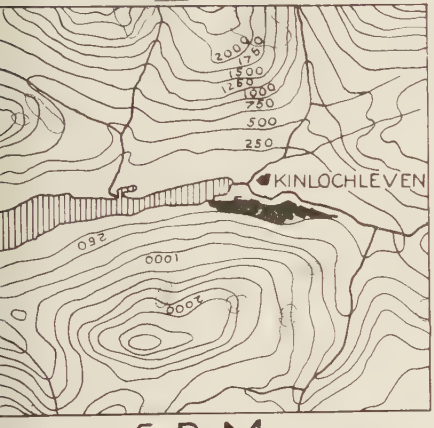

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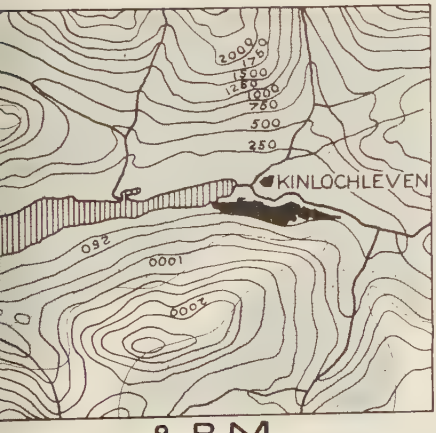

8 P.M.

midsummer.

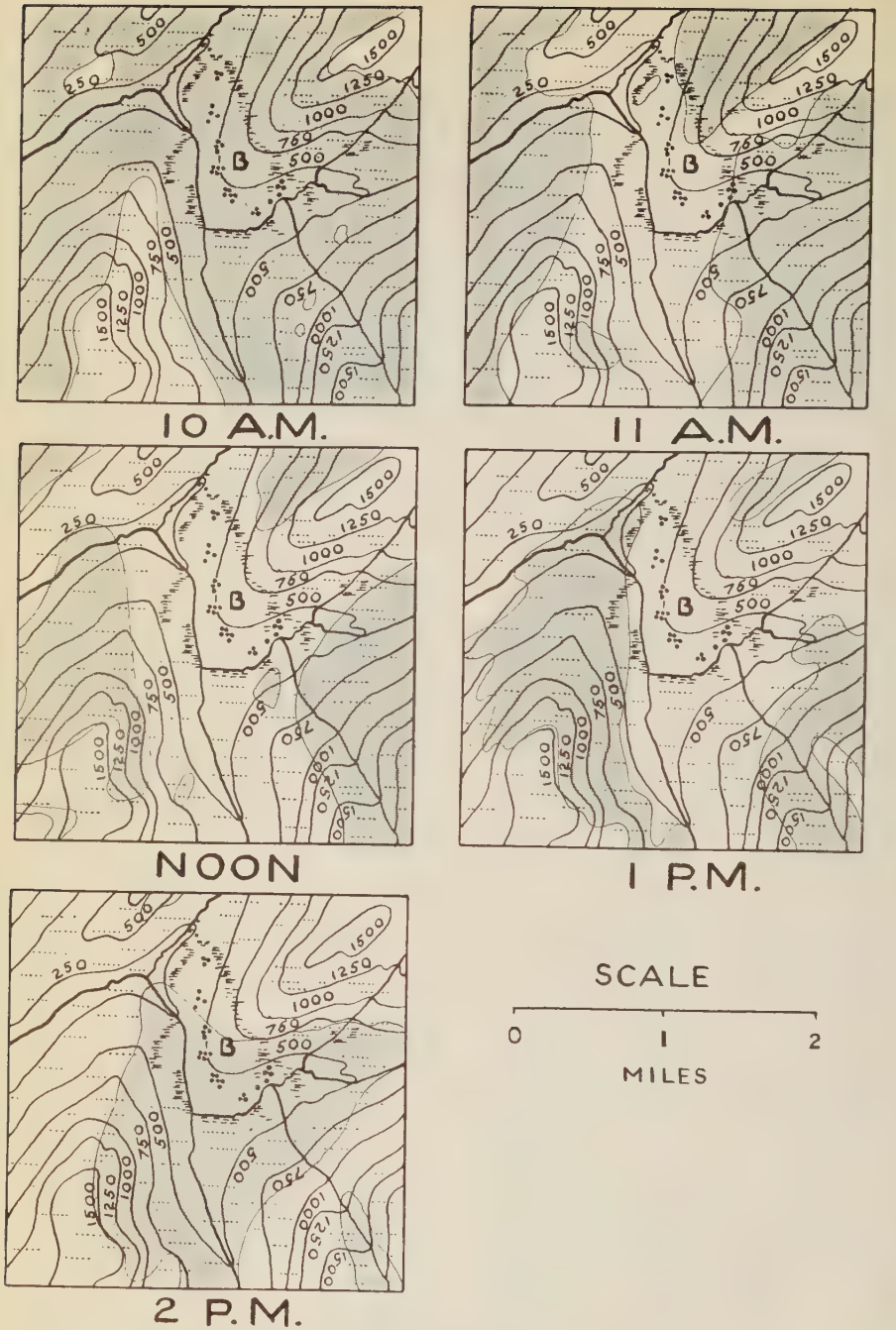

FIG. 10. Hourly shadows at midwinter. B = Blarmachfoldach.

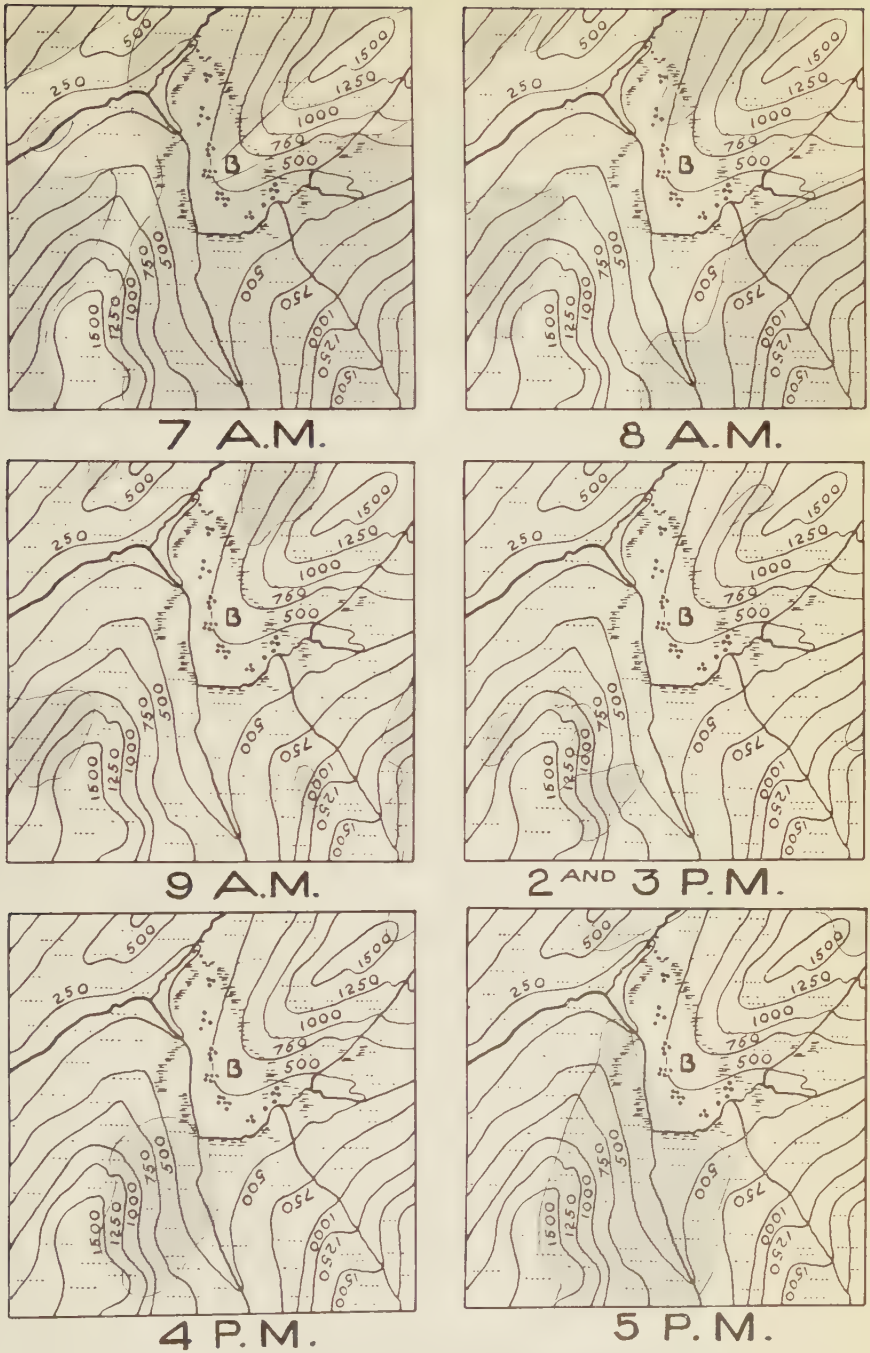

FIG. 11. Hourly shadows at the equinoxes.
(*N.B.* There are no shadows from 9 a.m. to 2 p.m.)

light income is this latter assumption necessarily correct. Thus the "law of *adret* and *ubac*" which applies so widely in alpine regions of lower latitude should not be expected to determine the settlement pattern in deep Highland glens; indeed, if sufficient attention is

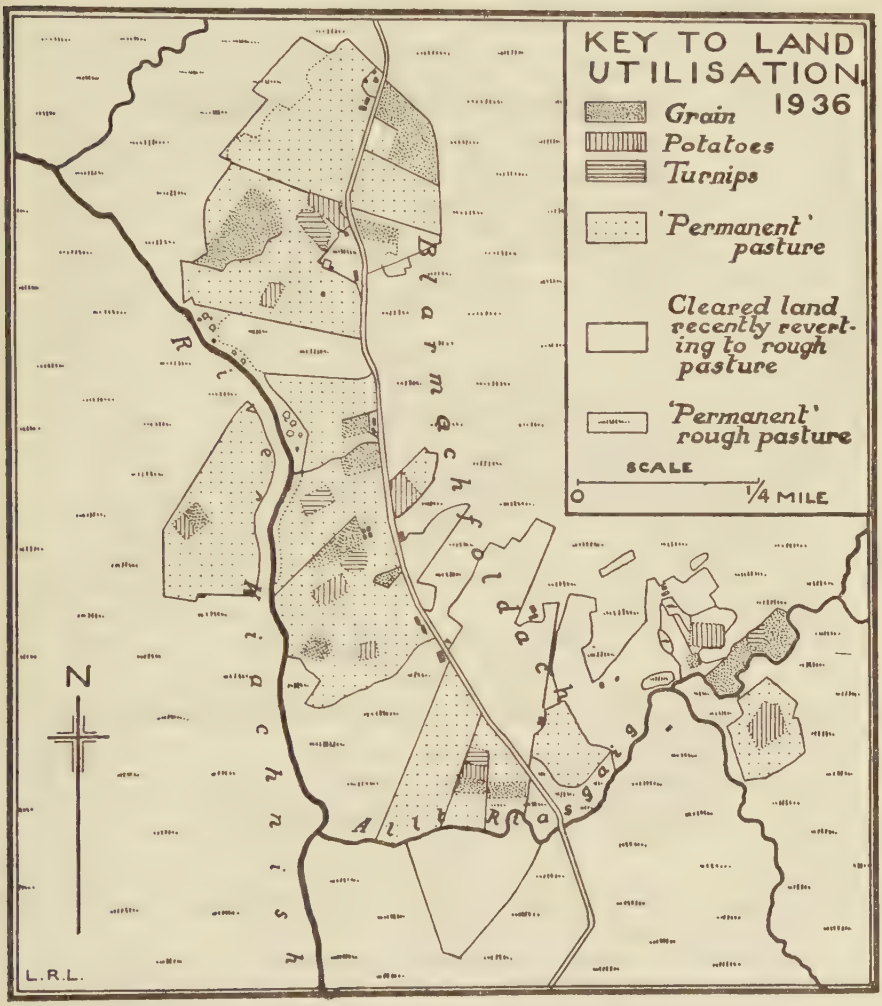

FIG. 12. Note: "Permanent" pasture includes all grass for both hay and grazing. The minor arable plots are substantially unenclosed, and major divisions marked frequently by balks or overgrown watercourses. In this district "grain" almost always signifies oats.

paid to the distribution of light in all its aspects it would appear that very frequently a reversal of this law is the more likely to pertain to high latitudes.

Fig. 13. Chart to show variations in the diffuse light sky area, for three stations (Blarmachfoldach) :

A. *Adret*, left to rough pasture, 25 per cent. loss.
B. *Adret*, cleared arable land, 12-13 per cent. loss.
C. West-facing slope, cleared arable land, 12-13 per cent. loss.
Inset : Map to show relative positions of A, B and C.

APPENDIX

Methods of Construction and Computation for the Diagrams and Maps included in the Text

A. *Maps and Graphs relating to sun duration and intensity.*

These are computed according to methods published previously ; see bibliographical references numbers 3 and 9.

B. *Charts to show the available diffused light income.*

Construct as follows :—

Mark on the large-scale map (*e.g.* Ordnance Survey, scale 1/63360) the station selected for study as the centre of a circle radius (to scale) three miles. Draw radii at intervals of 10 degrees for this circle.

For each ray in turn, construct a vertical section true to scale within a semicircle APB, where X is the station and P the Zenith above that station (Fig. 14). Define, in relation to surface relief, the sector of the sky hemisphere that is visible from X (*e.g.* QXR, Fig. 14).

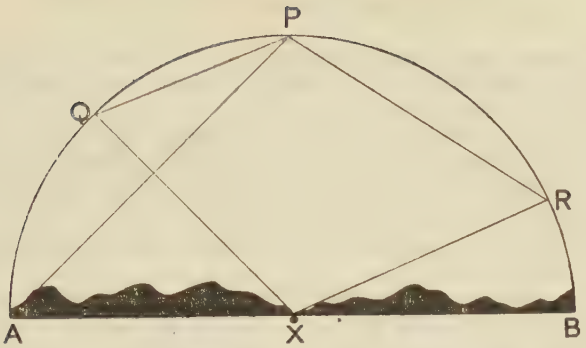

FIG. 14. Diagram to show the amount of sky lighting lost as a result of relief; *e.g.* for the station X, the sectors XAQ and XRB. Sky light is available only from the sector XQR, as compared with the total sky hemisphere APB.

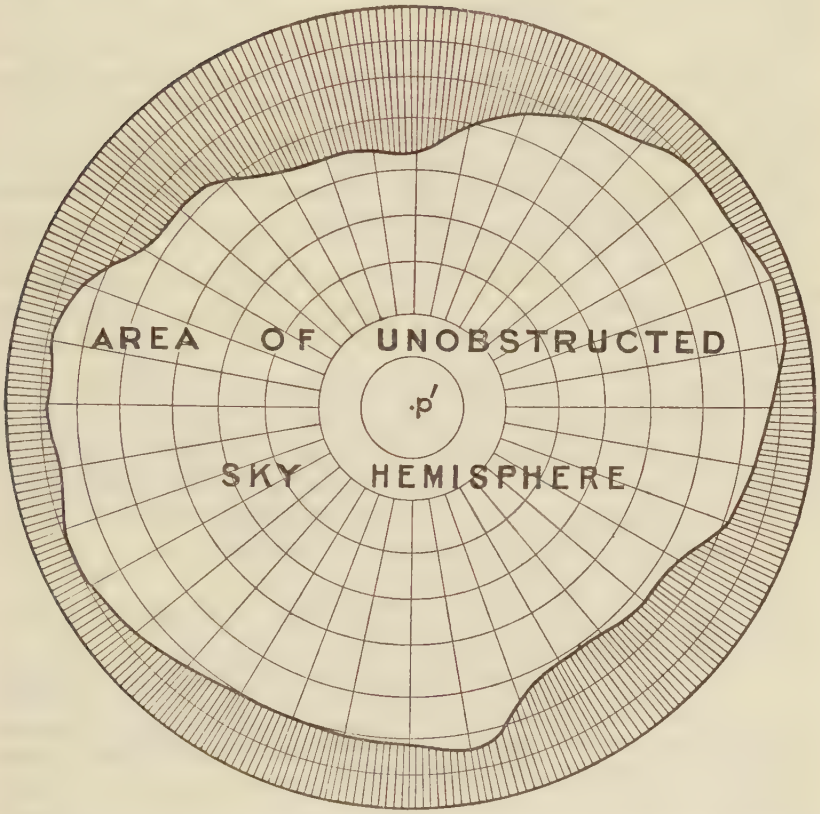

FIG. 15. Complete projected sky chart showing the area of diffused sky lighting permanently lost on account of relief, for one station on a south-facing slope of Glen Nevis.

On a separate sheet of paper draw a circle radius PA (Fig. 14), and set off radii at intervals of 10 degrees to correspond with those on the map (*e.g.* circle centre P′, Fig. 15).

Mark off along the appropriate ray in Fig. 15 the chords PQ and PR (Fig. 14), measuring these distances from the centre of the circle (P′, Fig. 15). For each ray draw a similar section and interpolate the appropriate chords on the chart of Fig. 15.

Join all points so obtained. This gives the irregular areas shown in Fig. 15 and Figs. 2 and 13.

The chart represents the projection of the sky hemisphere and the outline of the unobstructed sky area, drawn to scale on the polar case of the Lambert Azimuthal Equal Area Projection, taking the sky Zenith as the centre of the projection. The area of the circle represents the largest possible area of diffused sky lighting from an unobstructed sky dome. The area of the irregular unshaded figure (Fig. 15) within this circle shows the proportion of the sky dome from which diffused light can be received. This can be expressed as a percentage of the total area available. If required, the area that is obstructed within any selected zone of the sky can be measured, if, as in Fig. 15,[12] the celestial parallels have been plotted on the projection.[13]

NOTES AND REFERENCES

[1] Compare, for example, the following differences of sun and shade temperatures with altitude: Whitby (20 m.), 5·6°; Pontresina (1800 m.), 17·5°; Diavolezza (2980 m.), 53·5°. (From J. Hann, *Handbook of Climatology*, 1903.)

[2] I. F. Grant, *Social and Economic Development of Scotland before 1603*. 1930.

[3] A. Garnett, "Insolation, Topography and Settlement in the Alps," *Geog. Rev.*, xxv, October 1935; and *Insolation and Relief—Their Bearing on the Human Geography of Alpine Regions*. Publication No. 5 of the I.B.G., 1937.

[4] See Met. Office Pub., *Averages of Bright Sunshine for the British Isles for Periods ending 1935*. M.O. 408, Air Ministry, 1936.

[5] I am indebted to Gordon Manley (Universities of Durham and Cambridge) for emphasising this point.

[6] W. Gorczynski, "O. Zwiazku między promieniowaniem rozproszonem nieba i stopniem usloneczniania," *Comptes Rendues des Séances de la Société des Sciences et des Lettres de Varsovig*, xxvii, 1934.

[7] A. Ångström, "On Radiation and Climate," *Geografiska Annaler*, vii, 1925.

[8] For an interesting example of the effect of relief on the diffuse light income in relation to vegetation, I am indebted to Professor Pearsall (Department of Botany, Sheffield University), whose field researches in the English Lakes showed that the depth to which lake vegetation descends beneath the water depends on the strength of light penetrating the water, while this is proportional to the degree to which the lake walls rise steeply above the water, restricting the sky lighting, or shelve back gently to increase the sky arc and therefore the depth to which plants can flourish.

[9] For cartographical and other methods of computation see :—

(1) A. Garnett, *op. cit.* 2.

(2) F. Debenham, *Exercises in Cartography*, 1937, pp. 63-64.

Other diagrammatic methods based on photographic or theodolite survey and geometrical cylindrical projection are described in :—

(3) R. Pers, *Recherches sur les durées d'insolation*, Grenoble, 1937.

(4) E. Stenz, *Sur la durée possible de l'insolation aux localités montagneuses, déterminées par la voie géometrique*, Warsaw, B. Mét. Hydro., 1934.

[10] I am much indebted to Miss Lois Latham, B.A., for her assistance in collecting Highland field and other local data (1936), and, where necessary, redrawing the maps and diagrams in a form suitable for publication.

[11] E.g. *Plan of the Lordship of Lochaber*, from Mr. Roy's Survey in 1812, 13 and 14. West Highland Museum, Fort William.

[12] I am indebted to Dr. C. A. Stewart (Department of Mathematics, Sheffield University) for advice and confirmation regarding the suitability of mathematical formulae and geometrical methods used in connection with this work.

[13] Cf. further applications in: Dr. K. Reucker, "Der Bergschatten" (Wien), *Verhandlungen des Zwölften Deutschen Geographentages zu Jena*, Berlin, 1897.

GEOGRAPHY AT THE BRITISH ASSOCIATION

The British Association met in Dundee on August 30th, and in Section E (Geography) about one-third of the papers had been read when on September 1st the session was interrupted upon receipt of news that the German forces had invaded Poland. For the third time on record in an existence of over one hundred years, circumstances made impossible the completion of the annual meeting, which dispersed after full emergency powers for the future conduct of the Association's affairs had been vested in the present General Committee. As it is a matter of some regret that as much as did take place of a promising meeting should have received of necessity small attention, it is perhaps appropriate that a reference in some detail should be recorded here.

The Presidential Address to Section E, delivered on September 1st by Mr. A. Stevens, contained a lucid examination of the most conspicuous geographical concept whose enunciation is associated with British geographical thought, the concept connected with the phrase *Natural Geographical Region*, especially in so far as it is exemplified in North America, Russia and Europe. It appears to Mr. Stevens that the unity of the natural geographical region is dependent in large measure upon organisation, in the shape particularly of communications, and in his address he went so far as to identify the well-developed *pays* of France with those areas within which communication has since medieval times been facile and co-ordinated. Even in the Midland Valley of Scotland, he pointed out, names like Menteith and Lennox have not completely lost their significance. In Western Europe the increased efficiency of communication, and recently the peculiarly intimate cohesion organised by the radio, have so far expanded the area throughout which a perfect neighbourliness may be found that it is possible nowadays to define the European nation-state as " a community occupying a natural geographical region as its immediate environment, because it is a natural growth limited by its geographical circumstances." Other points from Mr. Stevens' written address will appear when it is published, as is hoped, in full.

It is to be regretted that, since progress with plans for a British National Atlas, introduced by Professor E. G. R. Taylor, must now be delayed indefinitely, the discussion which took place between sectional representatives on this subject has become for the present of almost purely academic interest. The scheme now advanced for the scope and arrangement of such an atlas is the work of a Committee of the British Association appointed at Cambridge last year, and is summarised in a leaflet from which the following extract is quoted :—

> " The proposed atlas aims at a strictly objective and scientific presentation of the natural conditions, natural resources and

economic development of the land (and adjacent sea), of the history and pre-history of the country, and of the distributions, occupations, movement and social conditions of the population. It is believed that the publication of such an atlas would mark a great step forward in the dissemination of accurate knowledge of the country among the general public. It would also be of service to administrators, public men, educationists and research workers in many fields, since it would present in convenient form the data upon which many conclusions, and decisions of national importance, must be based."

Contributing to the discussion, Professor Boswell (Geology) emphasised the desirability of mapping the availability of water supplies, in order to avoid a repetition of mistakes which have undoubtedly been made in the location of industry and the agglomeration of population for other purposes. Dr. Julian Huxley (Zoology) proposed the inclusion of maps of glaciation (so far as this is known), of the main periods of animal immigration, of the incidence of common diseases, and of what he called " negative amenities," which would be an attempt to show the extent of pollution and contamination of all kinds. Sir John Russell (Agriculture) remarked the inadequacy of the scale proposed (1/M) for an important distribution such as that of soils, pointing out that in many places this map would represent no more than a slight advance on the Drift Edition of the Geological Survey. He suggested also that in the representation of agricultural distributions by means of dots, wilful distortion should be employed in order to make differences appear appreciable ; and expressed the hope that where long-period data exist, we should seek to represent *trend* by map *series*. Dr. Butcher (Botany) advised the meeting that for many botanical distributions the data were incomplete and likely to remain so, particularly since little or no work had been recorded on the negative side. Mr. K. H. Huggins wished to see a central depository established for the collection of existing work, and recommended that everyone privately engaged on map work of any description should be encouraged to use the scale of the National Atlas, in case the work should prove of sufficient value or merit to be incorporated therein. Most speakers gave it as their opinion that a number of tentative or incomplete maps would have to be included, but most probably the expenses of production, which will preclude the possibility of frequent revision, will account for many omissions. In the plan of the atlas envisaged by the Committee, provision has been made already for maps of many of the subjects suggested, and manuscript maps prepared for the information of the Royal Commission on the Location of Industry, such as were on exhibition during the meeting, will form the foundation of others.

Three Scottish papers were communicated. Under the title,

Town development in Scotland, Mr. K. H. Huggins presented, with a wealth of diagrammatic illustrations, his historical analysis of the composition of the populations of selected Scottish burghs according to the occupations of their inhabitants. From his graphs the present predominantly urban character of the population and the over-dependence of Scotland upon specialised or single-industry towns plainly emerged. This paper was followed immediately and to some extent supplemented by one from Mr. A. J. Hunt, on *Some aspects of the internal geography of Edinburgh.* Mr. Hunt sought to distinguish zones in Edinburgh within which the premises are used substantially for the same purpose, relating his *quartiers* to the physical site and further discriminating among the residential districts on morphological grounds. One does not need to be well acquainted with Edinburgh to appreciate the perplexity with which Mr. Hunt must have approached, for instance, the Cowgate, and four coloured maps of the original survey on the 25-inch scale displayed during the meeting bore witness to the laborious detail underlying Mr. Hunt's broad conclusions.

Mr. D. L. Linton, whose field studies of southern Scottish drainage systems are well known, submitted further evidence in support of the theory that the primitive tilt of the land was due eastward instead of, as previously supposed, south-eastward, under the title *Some aspects of the evolution of the rivers Earn and Tay.* Whereas these rivers as we know them have altered the shapes of the soft lowland valleys, the harder rocks of the uplands (Ochils and Sidlaws) have preserved traces of an earlier drainage pattern in the shape of gaps and valleys now dry. It is by seeking out and correlating the levels and directions of such abandoned valleys, in places confused by subsequent glaciation, that Mr. Linton has substantiated his reconstruction of an earlier land surface tilted directly to the east and carrying eastward-flowing consequent rivers.

Few of the social functions and none of the longer excursions had taken place when the session abruptly closed. The city and officials of Dundee, who made such strenuous efforts at a cost not merely financial to entertain their guests at a time of abnormal strain, deserve a special word of praise and thanks.

REVIEWS OF BOOKS

EUROPE

Studies in the Development of Edinburgh. Published by the Edinburgh and East of Scotland Regional Group of the Institute of Public Administration. Edinburgh and London : William Hodge and Co. Ltd., 1939. *By subscription.*

There are innumerable books on Old Edinburgh, her history, traditions, notable citizens, and relics, but for the stranger, or indeed for a citizen of the metropolis, there has been hitherto no handy book of reference giving concise,

comprehensive, and up-to-date information such as any intelligent enquirer could desire—and appreciate. This want has now been supplied by the admirable little book just published.

A glance at the list of subjects treated, over seventy in number, shows the width of the field, while the names of the experts who have contributed are a guarantee of the technical knowledge and experience of the expert writer. Each article is the frank contribution of one at home in the matter with which he deals, and there is a refreshing absence of dry statistics.

A captious critic might complain that a bare reference on page 50 of the second series to the formation of a City fire establishment in 1824 is all that is said of the admirable and effective system now existing. C. B. B. W.

Scotland under Trust. By Robert Hurd. London : A. and C. Black Ltd., 1939. *Price* 6*s.*

This book contains brief descriptions of the various properties taken over by the National Trust for Scotland. It is quite surprising to learn of the large number of properties which the Trust possesses after a comparatively short existence. Their variety is as remarkable as their number : Roman walls and old houses, National Parks, Bird Sanctuaries and abbeys are all represented.

The book is well illustrated. A. H.

The Lowlands of Scotland (" The Face of Britain "). By George Scott-Moncrieff. London : B. T. Batsford Ltd., 1939. *Price* 8*s.* 6*d.*

This volume maintains the high standard which has been established by its predecessors in " The Face of Britain " series of Batsford books. It is perhaps surprising that the most populous and best known area of Scotland should claim attention at so late a stage in the series. The reader need only glance at a few of the admirable photographs, which number 115, to realise that in the Scottish Lowlands one may find a scenic and architectural beauty second to none. The text is worthy of the illustrations, and although no author could hope to do justice to the scenery, history, agriculture and commerce of the heart of Scotland within the compass of 128 pages, the writer has chosen his material wisely and with a praiseworthy avoidance of long scenic descriptions. He has laid stress upon buildings, with their historical associations, and upon the modern social problems which so deeply affect the area under review. Beginning appropriately with Galloway, still a lovely and unspoilt country almost unknown to the tourist, he passes to the more familiar Border counties, thence to the Lothians, to the industrial Middle West, which contains half the population of Scotland, to Fife, which still retains its insularity and old-world charm, and finally to the North-East, with its Aberdeenshire cattle and its great fishing industry. It would be easy to criticise so slight a work, which after all does not claim completeness. The main object has been achieved, and the " foreigner " about to try his luck in Scotland could wish for no better introduction. D. G.

The Story of Lorn, its Isles, and Oban. By Hugh Shedden. Oban : Oban Times Ltd., 1939. *Price* 10*s.* 6*d.*

It is a pity that the late Mr. Hugh Shedden was not able to revise the collection of articles which makes this book and to write it in a more connected form, for the disjointed style, sometimes reminiscent of note-book jottings, detracts from an otherwise interesting work. Nevertheless the story of Lorn is vitally interpreted. An immense amount of loving study could alone have collected the great store of legend and history here brought together ; and if only full reference had been made to the sources of his stories, Mr. Shedden would have added an invaluable contribution to Scottish letters. Forgetting the nervous style and the sometimes doubtful geological interpretations of scenery, losing oneself rather in the love of the land, in the amazing richness of its story and in the often felicitous descriptions of its natural beauty, one could well enjoy this book. It is the sort of thing an emigrant from Lorn would have to take with him. J. W. W.

The Institute of British Geographers : 9. Transactions ; and 10. Structure, Surface and Drainage in South-east England. By S. W. Wooldridge and D. L. Linton. London : George Philip and Son Ltd., 1939. *Price* 12*s.* 6*d.*

What is the function of geomorphology ? Is it an end in itself or is it to be the handmaiden of regional geography ? Is it possible to make an adequate regional study without a thorough-going preliminary analysis of land forms ? These are some of the questions that urgently present themselves for consideration on reading this excellent essay on physiographic evolution. The authors are convinced that regional study without an adequate basis in geomorphology is a structure built on sand, and whether or not others are in agreement with this view they will at least admit that the foundations are greatly strengthened thereby and that the value of the study is enormously enhanced. But is it practicable ? This work, still incomplete in some aspects, has occupied the attention of two indefatigable and highly-trained men for at least ten years, and there can be few who would be willing to devote that time to a preliminary survey of the terrain. Regional geographers in south-east England owe a large debt to the authors for providing not merely a description, but a thorough explanation of the landscape and drainage of this important region ; workers elsewhere will envy them their good fortune and will probably continue to borrow their own " physical basis " from the geologist. The complete inadequacy of such a physical basis is one of the lessons presented and doubly underlined on nearly every page of this essay.

Reversing the geologist's dictum, the authors declare that the past is the key to the present, that the landscape can only be understood by an examination of its evolution, stage by stage. Beginning with the Palaeozoic floor they review in turn the accumulation of the cover, the pre-Tertiary erosion cycle, the Eocene and Oligocene growth stages, the " Alpine " structures, the Mio-Pliocene peneplanation, the Pliocene transgression, the post-Pliocene drainage evolution and the Great Eastern glaciation. The area covered is the region lying south and east of the main chalk escarpment between Dorset and the Wash, and within this area they give us the results of detailed and patient research, some of it already published elsewhere, but here for the first time the picture is presented complete.

The production is a credit to the Institute of British Geographers and the illustrations are models of clear draughtsmanship, though the absence of place-names on the maps makes it necessary to use large-scale maps in locating the great number of hills, rivers and other physical features mentioned in the text.

A. A. M.

East Anglia. By Doreen Wallace. London : B. T. Batsford Ltd., 1939. *Price* 8*s.* 6*d.*

This volume of the " Face of Britain " series fully maintains the high standard of its predecessors. East Anglia, owing to the variety of its scenery and architecture, its long history, and its diverse agricultural activities, affords the author abundant material for her task. She has been inspired by a keen artistic sense and has produced a book which is as attractively written as it is full of information. The first part gives a general account of the varieties of farming, which depend on the nature of the soil of the four geographical regions into which East Anglia may be subdivided. Part II deals in more detail with the history, scenery, architecture and human activities of each region, viz. : (1) the Fair-to-good farm land, (2) the Fens, (3) Breckland, (4) the Broads. A final chapter includes the Wash, and the coast of Norfolk and Suffolk. The characteristics, especially of the Fens and Breckland, are portrayed with true artistic feeling. The advantages of Breckland as a quiet holiday resort are worthy of attention. To anyone contemplating a motor tour through East Anglia this book would provide an ideal guide, and certainly a guide-book without tears. It has the further advantage of containing 148 superb photographs. But alas ! there are no numbered references to these in the text, which is a great annoyance to the conscientious reader. Again, although roads are constantly referred to in the text, none are delineated in the two maps ! From the point of view of encouraging adult

education, the value of this charming book would be much enhanced if it contained a short introductory chapter dealing with the Geology of East Anglia in such a manner as would explain the evolution of its characteristic landscapes, and the differences in its agriculture. H. J. S.

Companion into Worcestershire. By MAXWELL FRASER. London : Methuen and Co. Ltd., 1939. *Price* 7*s.* 6*d.*

Miss Maxwell Fraser is very conscientious, very painstaking, very thorough. For the dweller in Worcestershire or as a literal companion her book is excellent. The wider circle of readers, however, may find it perhaps too detailed. Miss Fraser is determined that we shall not miss a single noteworthy epitaph or historical memory. If one were making a pilgrimage through Worcestershire, to read the appropriate chapter before visiting the district would be useful, but the Armchair Traveller may be troubled by the continual leaping from century to century and back again.

Worcestershire is rich in notable people in its history, from Simon de Montfort and William Langland, author of *Piers Plowman*, in the thirteenth and fourteenth centuries, to Lord Baldwin in our own day. Of the six children of a Worcestershire Methodist minister, one daughter married Sir Edward Burne-Jones, another married Sir Edward Poynter, President of the Royal Academy, a third married Mr. Kipling and became the mother of Rudyard Kipling, and a fourth married Mr. Baldwin and became the mother of Lord Baldwin. But this county was important long before de Montfort's day : Droitwich was famous in Roman times, and the considerable number of pre-Norman churches point to a degree of culture in the so-called Dark Age.

The illustrations are sixteen excellent photographs and a map. H. C. H.

Dorset (Shell Guide). By PAUL NASH. London : Faber and Faber Ltd., 1939. *Price* 3*s.* 6*d.*

Like its predecessors in the series, this work does not follow the pattern of the conventional guide-book. The subjects chosen for description include such varied topics as geology, sport, food, the Dorset language, and ferry time-tables. Many of the photographs are especially attractive, but one must doubt the wisdom of including reproductions of water-colours when these appear in black-and-white on a pink paper. Dorset is a county which will always interest the English-speaking world because of its association with Thomas Hardy, and this new guide is sure to be valued by many readers of the great novelist who are unable to visit the county personally. E. W. G.

Gloucestershire (Shell Guide). By ANTHONY WEST. London : Faber and Faber Ltd., 1939. *Price* 3*s.* 6*d.*

Companion into Gloucestershire. By R. P. BECKINSALE. London : Methuen and Co. Ltd., 1939. *Price* 7*s.* 6*d.*

Gloucester is the county of a large and popular portion of the Cotswolds, of cider and of perry, of the Poet Laureate, F. W. Harvey and *John Halifax, Gentleman*, a county of which it would seem difficult to write anything fresh. This feeling perhaps explains but does not altogether excuse Mr. West's somewhat blasé approach, by which a really inspired collection of photographs and the presentation of some interesting tit-bits of information are marred. We cannot approve of " not so hot " as a description of church frescoes. In the author's own idiom, " no prizes."

Mr. Beckinsale's style is better suited to the mellow placidity of the landscape he loves but does not over-sentimentalise. By comparison Mr. West knows no history, nor does his facetious treatment improve upon Mr. Beckinsale's occasional quiet humour. To Mr. West one turns curiously to see what fun he will make of the places that one knows : but of Mr. Beckinsale's book there can be no greater praise than that it makes interesting a greater number of small churches than one can ever hope to see.

A notable omission from both books is mention of Daneway, a venerable and well-preserved house near Sapperton, the more so since it is open to the public.

Happy Countries. By V. C. Buckley. London : Hutchinson and Co. Ltd., 1939. *Price* 12*s.* 6*d.*

This is a report of a happy holiday spent in the four happy countries, Denmark, Sweden, Finland and Norway, to name them in the order of Mr. V. C. Buckley's motoring tour. The reader leaves the report of one country with the same regret as the traveller did when he crossed the frontier, but also full of expectation that the following chapters will be as interesting. And he is not disappointed : from beginning to end the book is most interesting, written in an easy style and giving a great deal of useful information.

Why the title, *Happy Countries?* The author gives as his reason : " These northern countries possess no political doctrines which they wish to spread and they are not situated in the direct path of proselytizing nations." Let us hope Mr. Buckley is right in his latter assumption ! But, quite apart from that, the reader gets the impression that the Scandinavian countries with their social services, education of high standing, culture and standard of living are indeed happy countries, well worth a visit. Each country is different in nature: Denmark prettily undulating with beech woods ; Sweden with a wealth of firs ; Finland, the land of a thousand lakes ; and Norway with her mountain scenery and her great fjords.

Mr. Buckley was wise to take his holiday before the proper tourist season, and that is perhaps the reason he managed to see so much, for he certainly used his time well, and it is only a pity he did not visit the province of Slesvig (which he erroneously calls Schleswig) on his way from Esbjerg to Copenhagen, as he would have found much of interest in the ancient towns where time seems to have stood still.

One word of advice to the reader : do not follow Mr. Buckley's example of clearing the breakfast table every morning of remnants to keep for a picnic lunch. No wonder the waiters and landlords looked askance ! E. S.

Danish Delight. By Monica Redlich. London : Gerald Duckworth and Co. Ltd., 1939. *Price* 8*s.* 6*d.*

" Pretty, charming, amusing, exciting, peaceful, sweet, delightful, and as many more nice adjectives as you wish " is how the authoress describes the pleasure gardens, Tivoli, in Copenhagen, but these same adjectives are also the best possible description of this richly illustrated book. *Danish Delight* is a mixture, very cleverly written in the form of a journal, the ingredients being a diary, monologues and dialogues, history, traveller's guide and sentiments. The authoress tells us in a most humorous way of her first year of married life in Copenhagen, and—as is so often the case—the immigrant becomes an enthusiastic patriot of the new country without in any way forgetting her native land.

In the midst of the humour the reader comes across sentences like these : " Nobody could be anything but fond of it [Denmark], and more and more fond the better he gets to know it " ; and " Here in Denmark there is peace, even if an anxious peace, and the people live such wise, happy lives that it is a pleasure to be among them and to learn whatever one can of what Denmark means."

Nobody should miss this entertaining book, whether they intend to visit Denmark or not, but they certainly will want to go to Denmark after reading it. E. S.

Holland : Crossroads of the Zuider Zee. By Hendrik de Leeuw. London : J. B. Lippincott Co., 1939. *Price* 15*s.*

This is a carefully-thought-out book by an American traveller who has turned to the land of his origin, and who writes of it with sympathy and even affection. The author has divided his work into two sections : about 150 pages are given to a well-prepared historical conspectus, from the days of " A measureless raft of

mud and sand," down through Roman, Germanic and Spanish rule, to the golden days after the Eighty Years' War and the increasing prosperity of the present time. The second part, of about 200 pages, is composed of chapters on the well-known larger cities, with routes through other parts of the eleven provinces, all of which are rich in historical and geographical interest. We commend the evident care which has gone to the preparation of this book—there is an exhaustive bibliography of fully six pages—and would endorse the author's suggestion that anyone intending to visit the Netherlands should prepare for their journey by reading this informative work. G.-B.

Catalan France. By Basil Collier. London : J. M. Dent and Sons Ltd., 1939. *Price* 18*s.*

As most of its pages call for constant reference to the large end-paper map, this book is intended rather for serious study than for armchair reading, but it is of course all the more valuable on that account. An admirable and somewhat original feature is the provision of a Gazetteer and Summary giving " guide-book " information which otherwise would have encumbered the text. A critical Bibliography many pages long is included to facilitate further study.

It is perhaps unnecessary to explain that Catalan France means the modern Department of the Eastern Pyrenees, or, in other words, the old Province of Roussillon together with half the plateau of the Cerdagne (the other half being Spanish). In his careful sketch of the history of the region Mr. Collier points out that the Roussillon in historical times has been successively under the influence of the Romans, of Barcelona, of Madrid and of Paris, and that of these four influences the first and second have been culturally the strongest. The bulk of the people still speak Catalan, but, owing to the fact that French is taught in the schools, they are unable to write it, even in private letters to relatives. For eight centuries, from 865 to the Treaty of the Pyrenees, the region was connected with Catalonia, forming for most of that time part of the Kingdom of Aragon, and the influence of Madrid from the reign of Ferdinand and Isabella onwards left little permanent result. The region having been joined to France since 1659, the inhabitants are loyal to that country, and, being largely peasants, are very different in their general attitude from the Spanish Catalonians, especially those of Barcelona.

An interesting chapter describes an excursion to Andorra, and the inclusion of this district is quite justifiable since the Prefect of the Eastern Pyrenees acts there as the representative of the President of the French Republic, one of the two co-princes of that tiny State.

The author's tastes are catholic, and besides writing a detailed account of the different regions he gives much valuable information about the climate, the scenery, the fauna and flora, the ecclesiastical buildings and the occupations of the people, including their amusements. The last-named section contains a curious description of a carnival " bear " dance at Arles-sur-Tech which seems to be a relic of a very ancient ritual act.

Of the numerous illustrations by Helen Kapp the reviewer prefers the line drawings to the larger ones done in wash, and would also like to suggest that a list of the chief dates would have been a helpful addition to the historical chapter.

It only remains to add that this is a book which one reads both with pleasure and with profit. M. E. N.

Reasons for France. By John Brangwyn. London : John Lane, The Bodley Head, 1939. *Price* 12*s.* 6*d.*

The title of this book is not very happily chosen, but the author might be called a twentieth-century Arthur Young, since he went from place to place observing with his own eyes and making personal enquiries everywhere as to the local industries and their history. He insists throughout on the following points : (1) " Paris is not France," and it is rather from provincial France that the country derives to-day its wealth and its strength. (2) The story of its com-

munications goes back far in time. Its roads were merely *paved* by the Romans ; they were marked out long before, and used amongst others by the Phoenicians when bringing tin from Cornwall. (3) Up to the Railway Age, France depended on its river system, partly for irrigation, partly for transport and travel, partly for supplying water power. In recent years the latter has largely been superseded by hydro-electric energy, or " white coal," again derived from streams and rivers.

(4) The industries of France, often of great antiquity, are still frequently carried on in small workshops or even in the homes of the workers, who sometimes labour for part of their time in their gardens or tiny holdings. None-theless they are often highly-skilled artisans, producing in the aggregate great wealth. Very remarkable too is the way in which, as the centuries went on and circumstances changed, one industry led on to another, or one beginning in a very small way expanded into something more important. Among the instances given are stories of the development of glove-making, of the making of clocks, of ribbon-manufacture, of the rubber industry (originating in an English rubber ball), and of the making of dye from the madder plant. Steel is said to have been first produced by monks of the Grande Chartreuse in the twelfth century. In one place wooden combs were, it is recorded, made from the eighth century onwards ; early last century horn was used instead of wood, and, later, celluloid ; this led to many different articles being manufactured from the last-named material. Again, briarwood pipes, " made in England," are really only polished in that country, and the story of their evolution in their place of origin is quite a romance.

To lovers of France, then, and to those interested in economic history this book will make a strong appeal, and it can be cordially recommended. A map has, of course, to be constantly consulted, and neither this nor an index has been provided. If this is due to the exigencies of cost, one would venture to suggest as preferable the omission of some or all of the sixteen photographs, excellent though these are. M. E. N.

Die Bäuerliche Siedlung des Ravensberger Landes bis 1770. By Hans Riepenhausen. Münster (Westphalia) : Universitätbuchhandlung Franz Coppenrath, 1938.

Das Osnabrücker Land im 18. und 19. Jahrhundert. By Friedrich Herzog. Oldenburg : Gerhard Stalling, 1938.

These studies of two contiguous areas of north-western Germany are creditable samples of recent German work in regional geography. It is noteworthy how in pursuit of their strictly geographical purpose—the analysis of a continually developing countryside—both authors make a deft use of historical technique. We are reminded of the long and scholarly tradition of historico-geographical studies in Germany which clearly still inspires new work. We are reminded, too, of our own deficiencies in the field of regional geography conceived as the present stage in the long-continued human adaptation of the country. For where can we find monographs on areas of Great Britain comparable with those of Germany treated by Herren Riepenhausen and Herzog ?

The scope of these works is rather wider than their titles indicate, and each treats alike the facts of physique, climate, vegetation and soils before examining in fuller detail the process of settlement and the nature of the utilisation. Herr Riepenhausen shows how the Ravensberg area, which lies between the Teutoburger Wald and the Weser, was continuously occupied from the Mesolithic period onwards. His principal concern is, however, to trace the evolution of settlement from the days of old Saxon settlement (about A.D. 800) until the eve of the modern industrialism of the nineteenth century. Herr Herzog is more concerned with recent centuries, but he too does not ignore the earlier history and prehistory relevant to the making of the present-day landscape. Both works are well illustrated and contain large-scale folding maps of land utilisation in the eighteenth century. It need hardly be suggested that studies such as these are by no means parochial in interest ; rather by their regional exactness they illuminate the historical and present geography of Germany. Further, the

authors show geographical acumen in selecting physically marginal areas, for that is where geography often becomes increasingly interesting. Both the Osnabrück and Ravensberg areas lie near the northern limit of Hercynian folding and extend into the hilly loess margin of the North German Plain. W. G. E.

The Island of Zeus : Wandering through Crete. By Ralph Brewster. London : Gerald Duckworth and Co. Ltd., 1939. *Price* 15*s.*

For once in a way here is a book about Crete that is not primarily about the antiquities of the island. This is an account of the wanderings of the author with a boy called Freddy (who appears to act as cook, if not " the captain bold and mate of the Nancy brig "), who buy a mule or a donkey now and then to assist them in their porterage of tent and baggage. The tent sometimes blows away, the rain usually descends in torrents, the supply of money is completely exhausted, and other misfortunes occur which occupy much space in the account ; indeed, the book is filled with relatively little else. There are photographs which give some idea of the land, and we gain much insight into the natives, their lack of vision, and their complete disregard for the value of both Greek and Byzantine buildings, as well as for any sense of beauty. W. L. C.

The Moving Tent. By Stephen Graham. London : Cassell and Co. Ltd., 1939. *Price* 8*s.* 6*d.*

We expect something very good from Mr. Graham, and in *The Moving Tent* he is at his best. He has returned to Yugoslavia, as in *The Last Passenger* and *The Vagabond.* He took his moving tent to the shores of Lake Ochrida, where he camped for some time, fishing and hobnobbing with people of all classes, mostly peasants. In his own fascinating style the author gives us a perfect picture of the country and its inhabitants ; especially do we get to know these last in a way no writer of the ordinary travel book conveys. Zeicher, Zhiko, Daphna and others are delightful studies, and Mr. Graham obviously has a perfect understanding of and love for his subjects. He is the perfect vagabond, and completely at home under all conditions—rain, heat, storms, hail and snow are alike to him and nothing can drive him from his beloved tent, or dilute his cheerfulness and content, or weaken his powers of observation. We get interesting sidelights, too, on political and economic conditions in Yugoslavia away from the beaten track and the large towns, as, for example, in the description of the visits of the income-tax men with their lorries to seize in kind what they cannot in cash, and the devices of Daphna and others to circumvent them. The marriage customs are described in the Marriage of Zaila, and the intense hospitality of the provincial Yugoslavian in the entertainment so freely afforded to the writer.

The only matter for regret is that there is no map to show where the Vagabond actually was. Apart from this omission the book is entrancing. S.

Ukraine and its People. By H. P. Vowles. London : W. and R. Chambers Ltd., 1939. *Price* 5*s.*

The Ukraine has bulked largely in the public eye for some time, yet so little is known of the country and its people, the political, economic and even geographical situation, that Mr. Vowles' book is very welcome. It includes a long survey of the history and oppression of the Ukrainian people under their various conquerors, and when we realise that they form one of the largest racial groups in Europe it would not be a matter for surprise if they should demand independence : should an outstanding leader arise, or an aggressive neighbour foment and exploit discontent, they probably will. At present the Ukrainians appear to be in the depths of poverty, and, except where they are under the rule of the U.S.S.R., to be one of the most miserable peoples in Europe. Mr. Vowles' work should convey some understanding of a people who have deserved better than they have received. S.

ASIA

Down the Jordan in a Canoe. By R. J. E. Boggis. London : S.P.C.K., 1939. *Price* 6*s.*

The first seven chapters of this interesting book narrate the adventures, difficulties and even disasters which befell the early explorers of the Jordan Valley. Then follows the story of the author's successful journey in 1932 by canoe from the Sea of Galilee to the Dead Sea, a truly remarkable feat for a clergyman in his seventieth year. From his personal experiences and extensive study of the relevant authorities, the writer has collected a mass of useful information regarding the geology of this marvellous rift in the earth's surface, its fauna and flora, geographical features and historical importance. The book should prove of special value to students of the Bible, while those interested in present-day Palestinian problems will appreciate its account of the new electrical and industrial operations of the Jordan and the shores of the Dead Sea. It does not, however, touch the Jew-Arab controversy. The illustrations are good, but a map would have been a great additional help to the intelligent reader. D. R.

A Scientist in Tartary. By Wilhelm Filchner. London : Faber and Faber Ltd., 1939. *Price* 21*s.*

This book recounts Dr. Filchner's expedition through Central Asia when he was engaged in a geomagnetic survey extending from Lanchow in Western China through Sinkiang to Srinagar in India. His course was roughly parallel to that of the recent journey of Sir Eric Teichman, but far to the south. The record of Dr. Filchner's observations is detailed and, naturally, appeals more to the scientific mind, but his adventures and misadventures in the course of his journey will appeal to any reader. Obviously, he encountered hardships of the utmost severity, especially towards the end of his travels, but his worst experience was his imprisonment for seven months at Khotan. At the same time it must be admitted that he was largely responsible for this trouble himself, as he was in Sinkiang in defiance of official prohibition.

His remarks would appear to confirm newspaper statements that Russia is gradually but inexorably pushing British influence and British subjects out of Sinkiang altogether. In these days of international tension it is pleasing to note the high appreciation of the author, a German, of the courtesy and kind help extended to him by British and Indian officials.

A word of commendation is also due to the translator. S.

Eastern Visas. By Audrey Harris. London : Collins, 1939. *Price* 12*s.* 6*d.*

Miss Harris is, she assures us, "an ordinary person" and did nothing but what any of us could do with an indulgent father and good digestion. This is her unassuming way of saying that with no previous experience of the East or knowledge of any of its languages she travelled alone by the Trans-Siberian Railway to Manchukuo, visiting thereafter Korea, Japan, China, Jehol, Indo-China and the East Indies (which find no place in this account, however), India, Nepal and Afghanistan. To record many of her impressions she has reproduced (even to the superscription) her letters home, because "my intention is to put myself back into each stage of the journey as I lived it at the time, not as seeing it in the now different person that living of it has turned me into." The style is not studied, neither is it strained. Miss Harris took everything in her stride, quite unrestrained by any consciousness of self-superiority, and with the benefit of family friends and introductions made *en route* of which she always took advantage, she managed in the course of nearly eighteen months to experience a great deal.

What is new in this book is Miss Harris, and the impact upon a sensitive, yet friendly and open mind, of the problems and ways of living engendered by the

East. Despite the lack of a common language, Miss Harris by courage and good humour succeeded in establishing contacts which contributed, we feel, to international understanding. The fact that her wanderings make a good story should in no wise detract from the value of a sincere and human attempt to formulate a philosophy for living.

The illustrations (for which no apology was necessary) have in some instances become a little blurred by enlargement.

AFRICA

The Land of Egypt. By Robin Fedden. London : B. T. Batsford Ltd., 1939. *Price* 12*s.* 6*d.*

Many people have written of Egypt, both of the Egypt of the past and the Egypt of modern times, but no book I have read has caught so well as this that strange " otherness " which differentiates this land of wonder and mystery from countries equally well known. Mr. Fedden has had a long residence in Egypt and has studied the country and its people, as well as its history and its geography, to a much greater extent than an alien usually does in the land of his adoption. Add to this a facile and graphic style of writing, and it will be appreciated that here is a book worth having—or giving, if you are looking for a present for someone.

Here is epitomised the story of the successive histories of the country, Pharaonic, Greek, Roman, Arab, Turkish, through all of which has flowed the Nile, bountiful yet relentless. The character of the successive generations of landowners and cultivators calls forth the statement, " The natural owners of the richest soil in the world remain on the borders of starvation." This, Mr. Fedden points out, is the result of a tradition of selfish or injudicious government. He who could pay got water for his fields, and still, in spite of all that has been done in recent years, " it will be a long while before Nile water will flow altogether by natural gravitation."

The Pyramids are described as " possibly the most monstrous creations, from both a practical and ethical view, ever made by human agency." A statement which, while possibly true, will in no way detract from their attraction.

The chapter on " The Living and the Dead " I thought exceptionally good. " At all times in Egypt death and the dead have imposed upon the business of the living." Here are accounts of tombs and mummies and stories of robbers breaking in on those awaiting the call to resurrection to a life they had expected to be as real as the one they were living when preparing for the next.

There is not a great deal of reading in the book, but what there is is good and the photographs are strikingly so. Another first-grade Batsford. T. R.

The Back-Garden of Allah. By Major C. S. Jarvis. London : John Murray, 1939. *Price* 7*s.* 6*d.*

In a back-garden one does not look for the best—this book is not Jarvis Bey's best—but one generally finds those oddments for which there is no room in the front-garden. Here we have a number of those oddments very amusingly and racily written, with that insight into the lives of those of whom he tells his stories that can only come from one who has been " an understanding soul." Major Jarvis's sense of humour must have helped him to bear many a weary burden : it has now prompted him to produce a book which will bring back amusing memories to many returned exiles, and will prepare intending visitants for what they may expect in and about Egypt.

Particularly good, I thought, is his true-to-life description of native motor travelling, and the story of the Pigeon-Post is great. Perhaps the best of all, though, is the Oleander Pipe-Stem story. A *fellah* growing a bush for its beauty ! There was bound to be a catch somewhere ! T. R.

Contributions à l'étude du Sahara occidental. Fasc. 1. *Gravures, peintures et inscriptions rupestres.* By T. MONOD. Paris : Librairie Larose, 1938.

This fascicule is the first of a series which will utilise the material the author has accumulated during missions to the western Sahara relating to the geology, natural history, archaeology and ethnology of the region. It consists of a detailed descriptive catalogue of the rock carvings, paintings and inscriptions which have been found in the area west of the Ahaggar and south of the Wadi Draa. There are numerous illustrations and over thirty photographs, and a small-scale map to show the position of the sites, of which there are about a hundred. The author divides the carvings and paintings into three periods : an early, probably Neolithic, a pre-Islamic or Libyco-Berber, and a modern or Arabo-Berber group. The inscriptions attaching to the second group seem to suggest that the drawings were intended to serve a magical purpose, to encompass a wish fulfilment. A similar interpretation, of course, has been placed on rock carvings in other widely removed regions, notably those of the Palaeolithic period in Europe, but the apparent support provided by the inscriptions (and those at Aïr) for the theory is a matter of general interest, although the periods involved are very different.

H. F.

In the same series are published : *Description de la Côte d'Afrique de Ceuta au Sénégal par Valentim Fernandes (1505-1507)*, No. 6. By P. de CENIVAL and T. MONOD. *Coutumiers Juridiques de l'Afrique Occidentale Française.* Tome I, *Sénégal*, No. 8. *Notes sur les Coutumes des Peuls au Fouta Djallon*, No. 11. By G. VIEILLARD.

AMERICA

Mexican Mosaic. By RODNEY GALLOP. London : Faber and Faber Ltd., 1939. *Price* 15*s.*

This aptly named book fully justifies the author's foreword that " The beaten track in Mexico is less a geographical fact than an attitude of mind, and experience is not to be measured by distance travelled." While there are well-told accounts of journeys to the provinces of Oaxaca, Michoacan and Jalisco, much of the value of the book lies in its wealth of information about the Indian tribes with whom the author had established good relations. He is able to tell us that over sixty different languages are still spoken by them, fourteen of which do not have a single root in common.

The mosaic which Mr. Gallop presents illustrates chiefly districts which are comparatively near to Mexico City, and is remarkable for a well-balanced combination of widely different topics. It includes interesting and little-known geographical facts worked into a clearly defined pattern, together with many personal details and historical data, to which are added legends from widely differing sources. We note his references to nineteen different tribes, which show intimate knowledge of their manners and customs, incomprehensible to the ordinary Aryan mind until explained by one who has witnessed them. The accounts of ancient games still played by different tribes call for special reference. The Flying Game of the Otomi, the Saqui Deer Dance, and several others come from far beyond Cortezian times, while the Mexican adaptations of the miracle plays of the later years show how these primitive peoples have responded to our Western vision.

The format of the book is distinctly good and the drawings by the clever pen of Mrs. Gallop have added to the pleasure with which we commend it to our readers.

G.-B.

An Eye-witness of Mexico. By R. H. K. MARETT. London : Humphrey Milford at the Oxford University Press, 1939. *Price* 8*s.* 6*d.*

This book is in itself an informative illustration of the way in which the expansion of British dominion and enterprise has promoted the development of lands which have been proved to contain great natural possibilities and wealth.

Mr. Marett gives interesting details from personal observation of the way in which the Mexican leaders have " dropped the pilot " and are endeavouring to carry on the different industries in which so much British capital has been sunk. His descriptions of the land and its people are written from intimate personal knowledge, but the greater interest of the book lies in its evaluation of the pressure and conflict of class interests as between the hidalgo, who cannot forget the traditions of his Spanish ancestry, and the mestizos, a constantly increasing majority, who seem already to hold the dominant power, political and economic, and to demand a control even more complete.

The chapters headed " Expropriation " and " Good-bye to Feudalism " are grim illustrations of the uprising of that aggressive spirit which demands " Mexico for the Mexicans " and has already taken over the oil wells, the finding of which had cost Lord Cowdray and his group several millions, without adequate compensation. We cannot but be reminded of the loss of the Isthmus trade when the Tehuantepec railway and canal were taken over twenty years ago.

We appreciate the spirit in which Mr. Marett writes of a people who have treated him so cavalierly, and can only respond to the caption of his closing chapter, " Whither Mexico ? ", with words which will have a familiar ring : " Quien sabe ? " G.-B.

AUSTRALIA

Our Back Yard. By Henry Hall. London : Angus and Robertson Ltd., 1939. *Price* 5*s.*

Much has been written and spoken but little has been done regarding the development of the " Empty North " of Australia. The writer of this small work is an expert pastoralist who has made a careful and unbiased survey of Northern Australia and who tries to show how it may become an asset instead of a liability. He throws a fresh light on the problems so often discussed : questions of water conservation, of sheep *v.* cattle, of capital outlay, of transport—to mention only a few, and his facts are carefully substantiated by figures. The arguments deserve every consideration at a time when one might expect unoccupied, yet habitable, country to be at a premium. The photographs give a good idea of the nature of the land, and the map, though a mere outline, enables the reader to identify the stations. Mr. Norman Bell contributes a chapter on the mineral resources of the Northern Territory and indicates how mining might become profitable.

D. G.

Wild Flowers of Australia. By Thistle Y. Harris. London : Angus and Robertson Ltd., 1939. *Price* 8*s.* 6*d.*

The compilation of a flora for a continent might well daunt an experienced specialist, which we understand Miss Harris is not. Obviously a text of 174 pages, divided into a popular description of 65 coloured plates and a scientific section which repeats the species previously enumerated, must be selective, and it seems, to say the least, strange to have recognised the " significance as a distinctive feature in the Australian vegetation " of the eucalyptus simply by its complete omission. The classification of the popular section is by colour, and although many of the plates, uniformly small as they are, do not lack attractiveness, it is open to doubt whether the book has been produced on a sufficiently generous scale, or compiled with sufficient care, to satisfy either of its intended publics.

POLAR REGIONS

Arctic and Antarctic. By Colin Bertram. Cambridge : W. Heffer and Sons Ltd., 1939. *Price* 7*s.* 6*d.*

A book on the technique of polar travel was long overdue. Here is one within small compass and admirably written that will be useful to all future

polar travellers and instructive to all readers of polar narratives. The average account of this or that expedition takes too much for granted and explains too little of man's accommodation to the peculiarities of polar climate and hygiene. This book discusses clothing, tents, food and transport, and does not ignore the motives that take men north and south and the insistent recall that haunts those of us who know the ends of the earth. Mr. Bertram has had a wide experience of Arctic and Antarctic, and the book is all the more vivid for having been written in part on sledge journeys in Graham Land. It is admirably illustrated with woodcuts, diagrams and contrasting photographs of past and present.

R. N. R. B.

OCEANIA

Let's See if the World is Round. By Hakon Mielche. London : The Travel Book Club, 1939. *Price* 3*s.* 6*d.*

In the spate of travel-books one occasionally, if rarely, comes upon a volume quite out of the common ; this is such a one. The author is a Dane, and a Danish friend, Mr. Möller, the staid owner of a prosperous school, was suddenly and severely attacked by wanderlust. He sold his school and bought a tiny sailing vessel, the *Monsoon*, and with a crew of a few fortunate friends, including the author, set off on a voyage round the world. Some of the crew were scientists, and collections, ethnographical, zoological and entomological, were to be made for Danish scientific institutions. Mr. Mielche appears to be a commercial artist by profession, and to have been general handyman on board. In any case this is his first book. Written in light-hearted, not to say flippant, style, it is surely unique in that in spite of the flippancy the author conveys a vast amount of information of the deepest interest without effort on the part of the reader.

The *Monsoon* left Denmark in winter, called at Salvage Islands, Teneriffe and St. Thomas, passed through the Panama Canal to the Galapagos and the Marquesas, and visited innumerable Pacific Islands, including Tahiti, Samoa, Fiji, New Caledonia and the New Hebrides. Mr. Mielche's description, with its light artistic and graphic touch, is delicious. An additional attraction is that the margins of nearly every page are decorated with humorous but realistic thumb-nail sketches of the subjects of Mr. Mielche's pen. The translation from the Danish is excellent.

S.

GENERAL

Weather in the Making. By Dorothy Fisk. London : Faber and Faber Ltd., 1939. *Price* 8*s.* 6*d.*

For her popular exposition of meteorology, as in previous volumes, Miss Fisk combines the requisite qualities of scientific knowledge, lucid explanation and a charming and entertaining style. Essentially for the layman, this book is well arranged, attractively printed, and illustrated with excellent plates.

From a general scientific point of view the chief criticism must be that the use of analogy is overdone, for, ingenious and delightful as many of them are, they suggest explanations which are often too simple to be true. The writer has, however, a happy choice of words and there are many excellent descriptions. In the second place, there are various errors which should have been avoided. Though the book was not written primarily for the geographer, some of these errors concern facts of geographical importance. Thus, whereas Stye (over 180 inches) and other moorland localities are known to have a greater mean annual rainfall, Seathwaite (130 inches) is stated to be the wettest place in England. The distinction between mist and fog is visibility, not at 550, but at 1100 yards. The *mistral* is said to blow on an average one day in two, but no period of the year is specified.

The chapter on winds is perhaps the least satisfactory so far as the geographical

application of physical principles is concerned. The seasonal fluctuation of the trade winds, for instance, demands some consideration of the thermal equator. The trade wind climate is not of necessity dry, as implied on page 87, neither does it account for all the Australian drought areas. Moreover, on page 88 Miss Fisk has inadvertently revived the old problem of the anti-trades, a term which, after being reluctantly expunged from text-books, has been since used specifically for the reverse currents of air at high altitudes above the trades. K. C. E.

General Cartography. By Erwin Raisz. London : McGraw-Hill Publishing Co. Ltd., 1939. *Price* 24*s.*

As a general survey this book will be considered very useful, with its many references, its full and most excellent illustrations, suggestive exercises and good index. The author, himself a teacher of cartography, shows a clear understanding of the science and art of making maps and states their problems both representatively and succinctly. If anything, however, his book suffers from being brief. For instance, the history of cartography, with which it begins, is sketchy ; though it has a good section on American mapping. Likewise the methods of constructing map projections are inadequately treated, even if their limitations, advantages and uses are discussed. Methods of representing relief, and distributional and statistical mapping, are explained more fully, while the actual technique of drawing maps, their great variety and their value to different sciences find a most useful discussion. For those generally interested in cartography and for students reading for a general degree this book will be of very great service, since such a wide survey has not been brought before into such convenient bounds ; but it needs supplementing for advanced study.

J. W. W.

Men and the Fields. By Adrian Bell. With Drawings and Lithographs by John Nash. London : B. T. Batsford Ltd., 1939. *Price* 8*s.* 6*d.*

To say that this book is slight does not imply that its author has only a superficial knowledge of his subject. His intention is to give atmosphere and touch our feelings rather than to give information for practical use, and this he does with his usual charm of manner. When one is tired it is a pleasure to read of the everyday events of a past generation, who probably worked harder and certainly worked longer than we do, but achieved nevertheless a leisurely contentment that is not easy to find in the world of to-day. B. D. L.

A Naturalist on Rona : Essays of a Biologist in Isolation. By F. Fraser Darling. Oxford : Humphrey Milford at the Clarendon Press, 1939. *Price* 7*s.* 6*d.*

Here is an excellent nature-book by a thoroughly scientific field naturalist who has been living on isolated islands and quietly absorbing a knowledge of the creatures of which he writes. In a previous work he has devoted much attention to red deer, and here he has again interesting things to say about them, but, as the title indicates, the island of North Rona has been his chief dwelling-place of late ; and it is perhaps the island of all others on our western coast where the Grey Seal can be found in great numbers at breeding time.

One does not need to read many pages in order to realise that Dr. Fraser Darling is not only a scientist, but by all his instincts an artist with an intense appreciation of colour and grouping, form and pattern. He is greatly interested in the social life of animals and also in the displays of bird groups, and there are many points brought out in this book which will appeal strongly to lovers of nature, and which will be most carefully noted by all who have done any work similar to that of the author. At the same time, he gives a careful description of the ruins of the little chapel on Rona, one of the earliest of Christian buildings in Scotland, and of the cell of St. Ronan. With careful hands he has replaced stones that have fallen out, has raised the lintel of the chapel entrance to its original position, excavated the altar surroundings, and placed querns found in the huts at one end of the little building.

An important chapter forms an argument in support of a national reserve for wild life in the West Highlands, an area well away from centres of population where the conservation of wild life can be secured ; not an area such as that at Lochgilphead, which may form the camping-ground of Scouts and hikers, so much as a place of seclusion to be visited by those who would live for a little amongst the creatures which would there find sanctuary. He points to the growing value of ecology in the understanding of life under natural conditions, and there is much in this chapter with which we most thoroughly agree. We are sure it will be of absorbing interest to all nature lovers.

The photographs are excellent, and perhaps we may refer specially to one of grey seals disporting themselves in the pellucid surf of the western ocean, for it is just such a picture as the reviewer has seen at the south-western point of Rona on an October day. W. L. C.

EDUCATIONAL TEXT-BOOKS

Local Studies. Prepared under the auspices of members of the Geographical Association's Standing Committee for Geography in Secondary Schools. Manchester : Geographical Association, 1939. *Price* 1*s.* 8*d.*—The study of local activities is now generally recognised as a necessary part of the school geography course ; it is emphasised, for example, in the new regulations of the Scottish Leaving Certificate. The rigidity of the time-table and the short time allotted to Geography in the school curriculum may limit the possibilities of collecting and interpreting local material, but any teacher who is anxious to use whatever opportunities there may be will find this pamphlet a very useful guide.

The pamphlet consists of a collection of reports by teachers who have had practical experience in local studies, and the variety of the reports shows that useful work can be done whatever the nature of the region, for the areas dealt with cover many different types. An introductory discussion on the many problems which arise in the study of a locality and an extensive bibliography will be of great interest and value to all teachers of the subject. S. C. F.

A Pictorial Survey of England and Wales. Section I : *The Oxford Region.* By C. F. W. R. Gullick. London : George Philip and Son Ltd, 1939. *Price* 2*s.* The object of this so briefly introduced survey is to train the student's geographical insight into the landscape he observes. With these examples from his home region as a nucleus, he should feel encouraged to extend and apply the principle, if only in the mind's eye. The method, which is not new but in this series is beautifully exemplified, is to print photographs side by side with simplified sections of the map, the correlation in each case being emphasised by a paragraph of explanatory text. Obviously the plates are supplementary to a more than primary knowledge of the region, acquired from other sources, and without which framework the achievement appears somewhat scrappy. For this particular locality, the features of the dry valley and the association of settlement with gravel terraces are well brought out. The survey will increase in usefulness in measure as future Sections add to its range.

OTHER BOOKS RECEIVED

GUIDE-BOOKS

Madeira, Canary Islands, Azores and Western Morocco. Leipzig : Karl Baedeker. London : George Allen and Unwin Ltd. New Edition, 1939. *Price* 5*s.*

Guide to Norway, Sweden, Denmark, Finland, Iceland. Edited by T. G. Barman. London : Thos. Cook and Son Ltd. Seventeenth Edition, 1939. *Price* 10*s.* 6*d.*

Paris (Traveller's Handbook). London : Thos. Cook and Son Ltd., 1939. *Price* 2*s.* 6*d.*

BIBLIOGRAPHY

The Pacific North-west: A Selected Bibliography, 1930-1939. Compiled by JOHN B. APPLETON. Portland, Oregon: North-west Regional Council, 1939. *Price* $3.00.

YEAR-BOOK

Official Year-Book of the Commonwealth of Australia, No. 31, 1938. Canberra: Commonwealth Government Printer, 1939.

NEW EDITIONS

Baghdad Sketches. By FREYA STARK. London: John Murray. First Cheap Edition, 1939. *Price* 6*s.*

A Text-book of Geology: Part I, *Physical Geology.* By C. R. LONGWELL, A. KNOPF and R. F. FLINT. New York: John Wiley and Sons Inc. London: Chapman and Hall Ltd. Second Revised Edition, 1939. *Price* 18*s.* 6*d.*

NEW MAPS AND ATLASES

EUROPE

SCOTLAND.—Ordnance Survey of Scotland.—Publications issued from April 1 to June 30, 1939.

Six-inch Scale Maps (revised). Quarter Sheets with Contours in Red. Price 2s. each. *Lanarkshire*—11 NE (1935-36).

1 : 2500 Scale Maps (revised). With Houses stippled and with Areas. Price 6s. 8d. each. *Angus*—53 : 4 (1937). *Ayrshire*—18 : 14 (1937), 9 (1937-1938), 16 : 4 (1937-38), 6 (1937), 23 : 2 (1937). *Dunbartonshire*—23 : 6 (1937), 8 (1937).

Geological Survey of Scotland.—Publications issued from April 1 to June 30, 1939.

One-inch Maps. New Series. Colour printed. Solid Edition. Price 4s. 6d. each. 22 *Ayrshire* (N). 32 *Edinburgh. Glasgow District.*

Solid, with Drift Edition. Price 4s. 6d. each. 44, *Argyllshire.* 53, *Inverness-shire* (SE). *Assynt District.*

Six-inch Scale Maps. With Geological Lines, uncoloured. Price 2s. 3d. With Geological Lines, coloured. Prices on application. *Lanarkshire*—7 SE. Revised edition, 1939, with added information to 1936.

ENGLAND.—*Map of the Carlisle Diocese.*—Scale 4 miles to 1 inch. By the Rev. EUSTON J. NURSE, M.A., F.R.G.S. Charles Thomson and Sons Ltd., Carlisle, 1939 (Second Edition). Price 1s.

A clear map for church administration, without topographic detail.

IRELAND.—*Touring and Motoring Map of Ireland.*—Scale 1 : 506,800 (8 miles to 1 inch). W. and A. K. Johnston Ltd., Edinburgh, 1939. Price 4s. 6d.

BELGIUM AND THE NORTH-EAST OF FRANCE.—Scale 1 : 380,160. Geographical Section General Staff, War Office, London, 1938 (Second Edition). Layered. Price 4s.

EUROPE.—Scale 1 : 1,000,000. Sheet North K. 34, *Sofia*. Second Edition. Geographical Section General Staff, War Office, London, 1938. Price 4s. with layers, 2s. 6d. without.

New Hand-Map of Europe, illustrating the Activities of the League of Nations and the Territorial Changes since 1914. Scale 1 : 3,000,000. Edited by George Philip, F.R.G.S., under the auspices of the League of Nations Union. George Philip and Son Ltd., London, 1939. Price, paper, folded in cover, 3s. Mounted on cloth, folded in cover, 6s. Mounted on cloth and varnished, with rollers, 8s. 6d. Mounted on cloth dissected to fold, with eyelets, 8s. 6d.

Political boundaries only, with details of changes of government, etc., and their dates, inset. A full and up-to-date summary map of post-war political history which is of absorbing interest at present.

ASIA

IRAQ.—*Basra.* International Map of the World. Scale 1 : 1,000,000. Sheet North H. 38. Geographical Section, General Staff, War Office, London, 1938. Price 4s. with layers, 2s. 6d. without; 5s. with air overprint.

BURMA.—*Survey of India.* Scale 1 : 126,720 (1 inch to 2 miles). Sheet 84-G/SE. Price 1 rupee 8 annas. Survey of India, Calcutta.

BURMA AND CHINA.—Scale 1 : 253,440 (1 inch to 4 miles). Sheets 83-P; 84-K; 94-C; 102-A. Price 1 rupee to 1 rupee 8 annas each. Survey of India, Calcutta.

CHINA.—*Hong Kong and Lema Islands.* Scale 1 : 80,000. Geographical Section, General Staff, War Office, London, 1938. Price 4s.

JAPAN.—*Geological Map of South Sakhalin.* Scale 1 : 500,000, and explanatory text, compiled by Kunio Uwatoka. Tokyo Geographical Society, 1939. Price, including text, 5 yen.

AFRICA

SOMALILAND.—Scale 1 : 250,000. Sheets 13 and 14. Geographical Section, General Staff, War Office, London, 1937. Price 3s. 6d. each.

AMERICA

UNITED STATES.—*Topographical Survey.* Scale 1 . 24,000—*Map of the Yosemite Valley, California.* Scale 1 : 62,500—*Arizona*, 1 sheet; *Arkansas*, 1 sheet; *Florida*, 2 sheets; *Illinois*, 2 sheets; *Kentucky*, 1 sheet; *Maine*, 2 sheets; *Michigan*, 1 sheet; *Mississippi*, 1 sheet; *Pennsylvania*, 1 sheet; *South Dakota*, 1 sheet; *Texas*, 1 sheet; *Virginia*, 2 sheets; *West Virginia*, 5 sheets. Scale 1 : 125,000—*California*, 1 sheet. Scale 1 : 24,000—*California*, 1 sheet. Scale 1 : 31,680—*Massachusetts*, 1 sheet; *Ohio*, 1 sheet. Washington, 1938.

PERU.—*Mapa del Peru* par el Servicio Geografico de Lima. Scale 1 : 1,500,000. Wall map mounted on rollers. Lima, 1938.

ATLASES

COLLINS-LONGMANS STUDY ATLAS.—Planned, compiled, drawn and produced under the direction of a Joint Advisory Board. W. Collins Sons and Co., Longmans, Green and Co. Ltd., London, 1939. Price 3s. 6d.

COLLINS-LONGMANS VISIBLE REGIONS ATLAS.—Planned, compiled, drawn and produced under the direction of a Joint Advisory Board. W. Collins Sons and Co., Longmans, Green and Co. Ltd., London, 1939. Price 2s. 3d.

The same boldly coloured plates in different bindings constitute these two atlases, the Study Atlas having in addition a set of over a thousand exercises on all types of information that can be conveyed by an atlas map. There are not a great number of names. The findings of the Land Utilisation Survey are generalised in a map of Britain (without Ireland) contributed by that Survey. Each atlas has an extensive supplement in photogravure.

ADMIRALTY CHARTS

ENGLAND.—*River Thames, Broadness to Mucking Flats*, No. 2151, Price 6s., April 1939.

ITALY.—*Genoa and Approaches*, No. 1461, Price 4s. 6d., April 1939.

ADRIATIC SEA.—*Venezzia*, No. 1442, Price 4s. 6d., April 1939.

GREECE.—*Bay of Navarin*, No. 211, Price 4s. 6d., December 1938.

PERSIAN GULF.—*Umm al Qaiwain to Ras al Matbakh*, No. 3707, Price 7s. 6d., April 1939.

AFRICA.—*South Coast: Approaches to Port Elizabeth*, No. 641, Price 4s. 6d., December 1938; *South-east Coast: East London to Shixini River*, No. 3770, Price 4s. 6d., March 1939.

BAY OF BENGAL.—*Domel Island to Pakchan River*, No. 3051, Price 4s. 6d., July 1939.

NORTH PACIFIC OCEAN.—*Gnomonic Chart, showing curves for San Francisco*, No. 42B, Price 4s. 6d., March 1939.

SOUTH PACIFIC OCEAN.—*Gnomonic Chart, showing curves for Panama*, No. 53D, Price 4s. 6d., June 1939.

SOUTH AMERICA.—*East Coast: Punta Coronilla to Cabo San Antonio*, No. 3064, Price 6s., May 1939.

CHILE.—*Plans on the Coast of Chile*, No. 3076, Price 4s. 6d., March 1939; *Plans on the Coast of Chile*, No. 3077, Price 4s. 6d., March 1939.

ARGENTINE.—*Quequen to Rio Negro*, No. 3066, Price 4s. 6d., March 1939; *Rio Negro to Isla Leones*, No. 3067, Price 6s., May 1939.

WEST INDIES.—*Cuba, Eastern Sheet*, No. 3865, Price 4s. 6d., March 1939.

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